



# Examination of students' willingness to change behaviour regarding meat consumption

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## ABSTRACT

The aim of this study was to assess the behaviour of Swiss students regarding meat consumption by analysing their current consumption habits, attitudes and knowledge, acceptance of meat alternatives and willingness to reduce meat intake. Data were collected through an online survey conducted in universities and universities of applied sciences among German- and French-speaking students in Switzerland ( $n = 498$ ). By segmenting the student population using an adapted transtheoretical model of change, four distinct clusters were identified: passive (14.7%), curious (6%), awoken (44.7%) and active consumers (34.6%). The results provide a deeper insight into Swiss students' dietary patterns, attitudes and knowledge concerning the impact of meat consumption as along with concrete practical interventions to target the different clusters and initiate and promote behaviour change regarding meat consumption. The ideal recommendations depend on the current stage of behaviour change. However, to reduce meat consumption, policy makers need to set specific, quantifiable goals within defined time frames while involving a variety of stakeholders.

## 1. Introduction

Meat has long been a central element of nutrition in many societies, and it has historically been regarded as a measure of development and a sign of prosperity in some societies (Pereira & Vicente, 2013). The increased consumption of meat over the last four decades is a phenomenon in developed countries and is becoming increasingly common in developing countries (Fabrizzi et al., 2016; FAO, 2016; Sans & Combris, 2015; Schmidhuber & Shetty, 2005). Major contributions to this trend include the development of the agricultural sector and the meat industry, the distribution and marketing techniques in conditions of intensified urbanization and infrastructure construction, and globalization (Fabrizzi et al., 2016; Hallström, Röö, & Börjesson, 2014; West et al., 2014).

As global change in ecosystems has become irreversible due to depletion of natural resources, sustainability has become a major priority for and an ongoing topic between policy makers, academics and the public (Dagevos & Voordouw, 2013). With regard to climate change and environmental degradation, there is scientific evidence that a nutritional transition towards reducing meat consumption and eating more plant-based foods will be crucial (Hartmann & Siegrist, 2017).

### 1.1. Implications of meat production and consumption

According to the Intergovernmental Panel on Climate Change (Edenhofer et al., 2014), the world is heading towards radical climate changes. The impacts of climate change are already visible, from rising average temperatures to higher frequencies of extreme weather events. An abundance of studies prove that a major contributor to these changes is the environmental impact of livestock production, which accounts for almost 20% of anthropogenic greenhouse gas emissions (e.g. Marlow et al., 2009; Westhoek et al., 2014). Another problem is that meat can serve as a significant reservoir of diseases that can be transmitted to humans (Alewy Almashhadany, 2021). The risks associated with meat and poultry have not remained constant; while some risks have been successfully contained or eliminated, new risks and diseases have emerged (Johnson et al., 2009; The Pew Charitable Trusts, 2016).

In addition to these problems, there are non-communicable diseases (NCD) that are major public health burdens in the 21st century (WHO, 2017). Nutrition plays an important role in the increasing relevance of NCDs. Modern eating habits that involve an over-consumption of red meat and processed meat products are closely linked to the risk of diseases such as high blood pressure, obesity, osteoporosis, cancer and heart disease (Alwan, Galea, & Stuckler, 2011; Eshel & Martin, 2006;

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McAfee et al., 2010). Processed meat also poses a threat of carcinogenic contaminants due to the use of high temperatures and additives such as nitrites and nitrates (Clonan, Roberts, & Holdsworth, 2016).

Another aspect of meat consumption that has been a common motivating factor for veganism and vegetarianism is animal welfare and suffering (Rothgerber, 2015). Around 75 billion land animals are slaughtered every year (FAO, 2016). With this number it is not surprising that the majority of animals live in factory farms. On the one hand, this enables 'some of the lowest prices' for meat consumers but is also associated with 'huge cost to the animals' (Williams, 2008, p. 375).

Overall, a global transition towards a more plant-based diet will help reduce the ecological footprint of food systems, improve human health and help alleviate harm and death to animals in the livestock industry (Alwan et al., 2011; Arcari, 2017; Clonan et al., 2016; de Backer & Hudders, 2015; de Boer, Schösler, & Aiking, 2017; Eshel & Martin, 2006; Fox & Ward, 2008). However, despite the compelling motivators and growing interest in sustainable consumption, a portion of consumers are still reluctant to change their nutritional routines and eat less meat (Lea, Crawford, & Worsley, 2006a; Lea & Worsley, 2008; Pohjolainen, Tapio, Vinnari, Jokinen, & Räsänen, 2016; Zur & Klöckner, 2014).

### 1.2. Positive developments regarding meat reduction

Some countries, such as Germany (Oberriter, Schäbenthal, & Ruesten Von, 2013), Sweden (National food agency, 2015), and the Netherlands (Kromhout, Spaaij, de Goede, & Weggemans, 2016) have developed food guidelines for their citizens that consider health as well as sustainability. These guidelines advocate the consumption of less meat and fish and provide other recommendations. In Switzerland, dietary recommendations are shown in the Swiss food pyramid (Swiss Society for Nutrition, 2011), and a maximum of one portion of meat (100–120 g) per day is recommended. However, 50 kg of meat per person (137 g per day) are currently consumed in Switzerland per year (Statista, 2020).

Worldwide, about one billion people are currently vegetarians or vegans, and about a third of Europe's population self-identifies as semi-vegetarians or 'flexitarians' (moderate or occasional meat and fish consumers) (Apostolidis & McLeay, 2016). A survey by SwissVeg (2021) showed that 5% of the Swiss population are vegetarians or vegans, and compared to 2017, 50% fewer meat eaters now believe that meat is healthy for them. Similar results were also found in a recent study by Götze and Brunner (2021). Besides other factors, such as sustainability, Götze and Brunner (2021) found that health strongly motivates consumer groups to eat less meat. SwissVeg (2021) further showed that only 17% of the queried eat meat because of its taste. However, as Götze and Brunner (2021) found, the taste of meat alternatives, which is not perceived as enjoyable by some consumer groups, may be an obstacle to their consumption of more of such products in lieu of meat.

Vegetarianism and veganism are much more widespread among the younger age groups than older ones (SwissVeg, 2021). SwissVeg (2021) examined meat consumption and renunciation in Switzerland by age group and found that 65% of vegans are between 14 and 34 years of age. Hence, one can assume that a certain portion of consumers are at least somewhat aware of the problems of overconsuming meat.

### 1.3. Barriers and encouraging factors to behavioural change

Still, there are obstacles preventing behavioural change regarding meat consumption. One such major barrier is the strength of consumption habits. Regarding food in general, habits are difficult to change, even when the consumer is provided with knowledge and has their awareness raised (Klöckner, 2017). This intention-behaviour gap is due to the facts that eating involves daily routines and good intentions, and attitudes are often insufficient to change behaviour; they also need to be reinforced by other factors (DEFRA, 2011). While socio-economic status is an important factor in making sustainable choices, there are no economic barriers for consuming certain meat alternatives and plant-based

sources of protein (tofu, tempeh, Quorn, plant-based burgers etc.) since the costs for these products are, in many countries, less than for meat (Faber, Schrotten, & Bles, 2012; Nagelhout, Hogeling, Spruijt, Postma, & de Vries, 2017; Resurreccion, 2004). The trend of consuming 'convenience' foods might be another perceived barrier to change, as consumers may believe that sustainable eating requires additional cooking skills or preparation time (Videira, Antunes, Scholl, Gaetaniello, & Reisch, 2012). Sociodemographic factors, education level and familiarity with meat substitutes have also been shown to be particularly important in consumer choices (Caparros Megido et al., 2016; de Boer, Schösler, & Aiking, 2014; de Boer, Schösler, & Boersema, 2013; Rutenfrans, 2015). University-educated and younger people may be more receptive to information on changing to a plant-based diet as they tend to be more willing to alter their diets than the non-university-educated and older consumer groups (Heuer, 2014; Lea & Worsley, 2008).

### 1.4. Theoretical framework of behavioural change

The transtheoretical model (TTM) conceptualises behavioural change by segmenting a population into groups based on the status of the person undergoing the change process (Prochaska et al., 1994). The stages of change model positive behavioural change that occurs through five separate stages: (1) precontemplation, (2) contemplation, (3) preparation, (4) action and (5) maintenance. Based on the idea that behavioural change happens over longer periods of time and unfolds in different stages, this study uses an adapted TTM to study consumption patterns among consumers in different stages (Tobler, Visschers, & Siegrist, 2011). The TTM is well validated empirically as a model of how behavioural change occurs. In real life, consumer behaviour is influenced by many factors and barriers. Therefore, linear and non-linear behavioural changes exist. In the TTM, for example, it is possible for one to relapse from one stage to an earlier one (i.e. returning to old habits, e.g. when vegetarians start eating meat again) or remain in one stage for longer before moving on to the next stage due to barriers (e.g. lack of financial resources or knowledge).

The first stage of the TTM, precontemplation, includes people who do not intend to take any action in the near future and often underestimate the potential benefits of changing their behaviour. In the contemplation stage, consumers already recognise that their behaviour might have some negative consequences; however, ambivalence (among others) keeps them from changing. The preparation stage is also often referred to as the determination stage. In this phase, consumers start taking steps towards behavioural change. In the last two stages, action and maintenance, the individual has already made changes and works not to relapse to earlier stages (Prochaska & Velicer, 1997; Schwarzer, 2008). The TTM encourages an assessment of an individual's current stage of change and accounts for (possible) relapses in their decision-making process. Using an adaptation of the determinants of each stage and modification of the transition time frames can provide suggested strategies for public health interventions to address individuals at various stages of the decision-making process (Verain, Sijtsema, Dagevos, & Antonides, 2017).

Building on the current knowledge of motivating factors and barriers to reducing meat consumption, the purpose of this paper is to gain a comprehensive picture of Swiss university students' behaviour regarding meat consumption using an adapted transtheoretical model of change. Using the TTM in an adapted form allows us to segment the student population. Using a large set of items, we define and evaluate each of the stages the students belong to by examining their current diet, attitudes towards meat and meat reduction, and evolution of dietary habits. This also allows us to better define the intention-behaviour gap regarding meat reduction. The motivation behind this study draws on the popularity of the topics of 'meat' and 'meat alternative', the dynamic meat market and that young people may be drivers of change. Swiss students represent an ideal group to be analysed because Switzerland has a

dynamic food market and a well-established education system. Four research questions are defined to elicit the above-mentioned profiles among the Swiss student population:

- 1) What major differences in meat consumption behaviour manifest at specific stages of change among the Swiss student population?
- 2) What are the factors that hinder or facilitate behavioural change?
- 3) What are the most important aspects of a nutrition-oriented transition towards meat reduction?
- 4) How essential is time management in the transition and the development of tailored strategies according to the stages of change?

## 2. Methods

### 2.1. Target group

An electronic survey was made available to bachelor's and master's students from eleven universities and six universities of applied sciences covering German- and French-speaking Switzerland. Students were chosen as the target demographic because, according to Vermeir and Verbeke (2008) they have (1) a high transformational potential to encourage, support and globalise new consumption patterns (e.g. reduced meat consumption); (2) they are receptive to new knowledge, skills, values and feelings; and (3) they have a high level of individual freedom yet are educated, so their habits of food consumption might be less influenced by other people. Students are likely to play a pioneering role towards more sustainable consumption in the future, and they will be of interest to those who want to or already produce, market or support sustainable food products.

### 2.2. Questionnaire and survey distribution

The research team developed an extensive questionnaire to reach the main goal which was obtaining information about students' attitudes, beliefs and prospective consumer behaviour regarding meat consumption and reduction. To accommodate language differences, the questionnaire was offered in English, German and French. The questions covered the following research topics:

- (1) Eating habits and lifestyle of the student population (30 items). This section contained questions about the students' nutritional patterns before and after coming to university, consumption of meat and meat alternatives and motives regarding the consumption of meat and meat alternatives.
- (2) Knowledge, attitudes, and beliefs regarding meat (35 items) (Clonan, Wilson, Swift, Leibovici, & Holdsworth, 2015; de Boer et al., 2017; Frank, Oytam, & Hughes, 2017; Santos & Booth, 1996; Vinnari & Vinnari, 2014).
- (3) Perceived benefits (22 items) and perceived barriers of a plant-based diet (19 items) (Lea et al., 2006a; Lea, Crawford, & Worsley, 2006b)
- (4) Decision-making process (13 items) (Glanz, Basil, Maibach, Goldberg, & Snyder, 1998) and desirable characteristics of a meat alternative (12 items) (Caparros Megido et al., 2016; de Boer et al., 2013).
- (5) Willingness to change behaviour. These statements were divided into four sub-sections: ranking of main drivers of change (5 items), factors of influence (8 items), obtaining and sharing information regarding meat reduction (8 items), recognition of personality traits (18 items) and reasons for the influence on the global transition (8 items).
- (6) Attitudes towards practical interventions regarding sustainable meat consumption (16 items) (de Boer et al., 2014; Hayley, Zinkiewicz, & Hardiman, 2015; Johanning, 2015).

- (7) Sociodemographic information (7 items), including gender, age, weight, height, enrolled university, academic level, nationality and household composition.

To reach and obtain data from Swiss students, the research team first contacted all Swiss universities and universities of applied sciences and asked for their support. Only a few agreed to share the survey via their email system and on their official websites. However, most of the data was gathered on site by handing out flyers containing information regarding the topic, including the survey link and QR code. This process took two weeks and consisted of travelling to campuses and personally addressing the students. The survey link was also shared to various student groups on Facebook as well as official webpages of student groups in Switzerland to increase the response rate. The survey was open for 6 weeks (in January and February of 2018), generating 503 collected responses. On average, the participants took 21 min and 30 s to complete the survey, which is relatively long for an online survey.

### 2.3. Data analysis

Tobler et al. (2011) demonstrated that the TTM offers an interesting toolset that can be used to segment a population regarding behaviour change. The TTM is interesting because it can depict both linear and non-linear paths of behavioural change and development (e.g. when consumers progress from one stage to the next and relapse again to a previous stage). In this way, the TTM is able to realistically depict how consumers behave in real life. To fit the context of this study, the TTM was adapted and applied accordingly. Eighteen items were used for the segmentation and categorised into four factors (Table 1). The statements were tested for internal consistency using Cronbach's  $\alpha$ . The results were satisfactory for all four factors ( $>0.70$ ). This approach was employed to assign each of the students to one of the four stages of change based on their motivation for behavioural change regarding meat consumption and then further describe each stage of change with the remaining variables. Using this method, the research team gained a comprehensive image of all clusters in which they were clearly differentiated. The four factors are named according to the stage of change they represent: precontemplation, contemplation, preparation, and action/maintenance.

Next, the mean scores of the factors were computed and subjected to

**Table 1**  
Factors and items used for the cluster analysis, including internal consistency.

Factor 1. Precontemplation	Factor 2. Contemplation
Cronbach's $\alpha$ : 0.76	Cronbach's $\alpha$ : 0.81
Why should I change when no one else does?	I am not convinced enough to change.
Why should I change when no one is asking for it?	For change, I need a personal reason.
Why should I discuss the topic of meat reduction when no one else does, even the media?	When everyone else sees the benefits, then I will change.
Reducing meat is a baseless campaign.	I need encouragement for behavioural change.
Change will come on its own, I do not have to do anything.	Sometimes I resist change even though I know I am not right.
	I become angry if I cannot have my opinion.
	Sometimes I give up if I do not see results.
	I want to be a good listener, but I need time to make a change.
Factor 3. Preparation	Factor 4. Maintenance/Action
Cronbach's $\alpha$ : 0.81	Cronbach's $\alpha$ : 0.82
It is time for a change.	I cannot stay quiet; our future is in question.
If it becomes alarming for our natural resources or health, I would be willing to change my eating behaviour.	I cannot wait for an intervention; I am too conscious and responsible.

a hierarchical cluster analysis using Ward's method and the squared Euclidean distance. Solutions between three and six clusters were assessed using the agglomeration schedule. Neglecting the two-cluster solution following Hair, Black, Babin, Anderson, and Tatham (2006), solutions between four and six were analysed using general linear models. After conducting contrast analyses and robust tests (Welch & Brown-Forsythe test), four distinct clusters were chosen as the final solution. Attitudes towards meat were compared between means of two main groups: pro-meat behaviour and contra-meat behaviour. Possible drivers for change were compared with mean scores as well as the decision-making process when purchasing food, characteristics of a meat alternative, level of interest in the topic, discussion, and possible practical interventions. In addition, perceived benefits and barriers of a plant-based diet were extracted using principal component analyses (PCA) based on eigenvalue and varimax rotation. After the exclusion of those items with differences of less than 0.10, only items that clearly loaded on one factor were included in the analysis. Furthermore, the internal consistency of the factors was tested and the mean scores of the factors were compared within the four clusters. Statistical significance for all analyses was measured using chi-square tests and analyses of variance (ANOVA) with contrast tests for differences between the individual clusters. ANOVA with contrast tests compare the mean of one cluster to the mean of the other three clusters combined to detect whether the cluster is significantly different from the other clusters.

### 3. Results

After removing respondents that completed less than half of the questionnaire, the response rate was  $n = 498$ . The cluster analysis identified four distinct segments of the student population: passive consumers at the precontemplation stage (14.7%), curious consumers at the contemplation stage (6%), awoken consumers at the preparation stage (44.7%) and active consumers at the action/maintenance stage (34.6%). The clusters were analysed and statistically compared based on their demographic features (Table 2); current diet (Table 3); frequency of meat consumption and experiences with meat alternatives (Table 4); evolution of habits after coming to university and reasons for meat

**Table 2**  
Demographic features of the clusters.

	Passive (14.7%)	Curious (6%)	Awoken (44.7%)	Active (34.6%)
<i>Gender</i> <sup>***</sup>				
Male	45.9%	66.6%	50.0%	39.9%
Female	54.1%	33.4%	50.0%	60.1%
Age	25.0	24.7	24.8	25.1
University	41.1%	40.0%	37.7%	47.4%
University of applied sciences	58.9%	60.0%	62.3%	52.6%
<i>Academic status</i>				
Bachelor 1st year	22.5%	29.2%	20.3%	25.7%
Bachelor 2nd year	14.1%	8.2%	19.8%	15.2%
Bachelor 3rd year	23.9%	16.7%	26.7%	27.5%
Master 1st year	9.9%	16.7%	13.4%	12.9%
Master 2nd year	29.6%	29.2%	19.8%	18.7%
<i>Household composition</i> <sup>***</sup>				
I live with my parents.	37.0%	25.0%	30.0%	24.1%
I live with my partner.	23.3%	20.8%	14.8%	14.4%
I live with my partner and children.	1.4%	4.2%	2.2%	3.4%
I live with my children and no partner.	0%	4.2%	0%	0%
I live alone.	12.3%	8.3%	11.7%	10.3%
I live in a flat-sharing community.	26.0%	37.5%	41.3%	47.8%
<i>Nationality</i> <sup>***</sup>				
Swiss nationality	86.3%	92.6%	78.6%	87.9%
Other	13.7%	7.4%	21.4%	12.1%

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001.

**Table 3**  
Current diet within the clusters.

	Passive	Curious	Awoken	Active
Meat eaters <sup>***</sup>	<b>85.1%</b>	60.0%	63.1%	29.9%
Flexitarian (occasionally eat meat or fish) <sup>***</sup>	<i>10.8%</i>	13.3%	30.2%	<b>33.3%</b>
Pescatarian (eat fish, but no meat) <sup>***</sup>	1.4%	0%	1.3%	<b>2.9%</b>
Vegetarian (eat no meat or fish) <sup>***</sup>	2.7%	20.0%	3.6%	<b>21.8%</b>
Vegan (do not eat meat, fish or other animal-based products) <sup>***</sup>	0%	6.7%	1.8%	<b>12.1%</b>
Total in cluster	100%	100%	100%	100%

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001.

Question: 'How is your current diet?'; **bold** = highest share, *italic* = lowest share.

<sup>a</sup> A flexitarian, according to the definition of Derbyshire (2016: 1), is someone that 'follows a primarily but not strictly vegetarian diet, occasionally eating meat or fish'.

**Table 4**  
Meat consumption frequency and experiences with meat alternatives.

	Passive	Curious	Awoken	Active
Meals with meat (per week) <sup>1</sup>	<b>7.53</b>	7.27	6.79	5.92
Have ever bought, prepared and/or eaten meat alternatives <sup>**</sup>	67.5%	76.5%	68.5%	<b>88.5%</b>
Meals with meat alternatives (per month) <sup>2</sup>	<i>2.50</i>	2.50	2.70	<b>3.74</b>

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001

<sup>1</sup> Sum of mean scores across three questions: meals consumed for breakfast, lunch, and dinner per week (0–9); **bold** = highest score/share, *italic* = lowest score/share on the questions segment, 'How many times per week do you consume meat (including processed meat, e.g. sausage, bratwurst, salami, ham, bacon; home and away from home)?' (breakfast, lunch, dinner; never, 1–2, 3–4, 5–6, daily)

<sup>2</sup> Mean scores of portions consumed per month (0–>9); **bold** = highest score/share, *italic* = lowest score/share on the questions segment, 'How many portions of meat alternatives do you eat per month? (1 portion = 100 g) Please also include food away from home.'

reduction (Table 5); knowledge, attitudes and beliefs regarding meat consumption (Table 6); perceived benefits of and barriers on the path to a plant-based diet (Table 7); factors of influence in the decision-making process regarding food (Table 8); desired characteristics of a meat alternative (Table 9); reasons for potential behavioural change regarding meat consumption (Table 10); and finally, attitudes towards possible practical interventions (Table 11). The discussion and communication regarding the topic were also evaluated; however, there were no significant differences between the clusters, which led to the conclusion that this population group is overall not very active on this topic.

**Table 5**  
Evolution of habits after coming to university and reasons for meat reduction.

Did your eating habits change after coming to university?	Passive	Curious	Awoken	Active
Reduced meat consumption by more than half <sup>**</sup>	9.9%	10%	16.7%	<b>28.8%</b>
Reduced meat consumption less than half <sup>**</sup>	22.5%	20%	30%	<b>36.9%</b>
Did not change meat-eating habits <sup>**</sup>	<b>60.6%</b>	55.5%	49%	30.7%
Increased meat consumption <sup>**</sup>	7.0%	<b>15%</b>	4.3%	3.6%
Environmental issues <sup>1</sup>	3.26*	3.67	4.07	<b>5.29***</b>
Changed eating attitudes (awareness) <sup>1</sup>	3.09*	3.67	4.17	<b>4.79**</b>
Limited money <sup>1</sup>	4.00	4.00	<b>4.18</b>	3.22*

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001

<sup>1</sup> Mean scores of the highest ranked items on a six-point Likert scale, 1 = 'strongly disagree' to 6 = 'strongly agree'; **bold** = highest score, *italic* = lowest score on the question segment, 'Why did you reduce your meat consumption?'



**Table 6**  
Pro and contra knowledge, attitudes, and beliefs towards meat consumption.

	Passive	Curious	Awoken	Active
Pro-meat	<b>3.16***</b>	2.07**	2.97***	2.07***
Contra-meat	2.30***	2.08**	2.89	<b>3.96***</b>

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001. Mean scores on a six-point Likert scale, 1 = ‘strongly disagree’ to 6 = ‘strongly agree’; items are listed in [Appendix A](#); **bold** = highest score, *italic* = lowest score.

**Table 7**  
Perceived benefits of and barriers on the path to a plant-based diet.

	Passive	Curious	Awoken	Active
<i>Benefits</i>				
Health benefits	2.55***	2.52*	3.10	<b>3.76***</b>
Ethical benefits	2.49***	3.25	3.41	<b>4.51***</b>
Economic benefits and convenience	2.38***	2.75	3.25**	<b>3.26**</b>
<i>Barriers</i>				
Health concerns and preferences	<b>3.10***</b>	1.97*	3.00***	1.94***
Availability and convenience	2.24	1.75*	<b>2.48**</b>	2.23
Food neophobia	<b>1.91*</b>	1.46	1.78	<b>1.33***</b>

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001. Mean scores of factors after PCA. Items listed in [Appendix B](#); **bold** = highest score, *italic* = lowest score.

**Table 8**  
Factors of influence when purchasing products.

When you are buying food, how important are the following factors?	Passive	Curious	Awoken	Active
Product quality	<b>5.22</b>	4.85	4.99	5.18
Freshness	<b>5.22</b>	5.05	5.15	5.17
Habit/routine	4.27	3.58*	<b>4.41**</b>	4.16
Price	4.28	4.40	<b>4.53</b>	4.36
Food budget	3.88	4.11	<b>4.28</b>	4.23
Availability	4.36	4.00	4.28	<b>4.49</b>
Taste	5.38	4.90	5.32	<b>5.41</b>
Convenience	3.92	3.40	<b>3.96</b>	3.84
Familiarity with preparation	4.07	3.70	<b>4.35**</b>	3.97
Product origin	4.61	4.40	4.67	<b>5.30***</b>
My personal belief	4.66	4.61	4.80	<b>5.38***</b>

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001  
<sup>1</sup> Mean scores of factors on a six-point Likert scale, 1 = ‘no influence at all’ to 6 = ‘very large influence’; **bold** = highest score, *italic* = lowest score.

**Table 9**  
Desired characteristics of a meat alternative.

‘I would consume meat alternatives if they ...’ <sup>1</sup>	Passive	Curious	Awoken	Active
... contained useful nutrients.	3.07**	3.33	3.93	<b>4.49***</b>
... had the same texture as meat.	2.42	2.12	<b>2.69</b>	2.59
... had the same sensory attributes as meat.	2.59	2.47	<b>2.91</b>	2.73
... did not look like meat.	3.00	2.24**	3.41*	<b>3.75***</b>
... did not taste and smell like meat.	2.82	2.29	3.29	<b>3.77***</b>
... could be easily combined in meals.	3.42*	3.00*	4.30*	<b>4.98***</b>
... was reasonably priced.	3.43***	3.89	4.45	<b>4.89***</b>
... was constantly available in the shops.	3.14***	3.32	4.17	<b>4.78***</b>
... was a safe product.	3.31**	3.11	4.24	<b>4.93***</b>

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001  
<sup>1</sup> Mean scores on a six-point Likert scale, 1 = ‘strongly disagree’ to 6 = ‘strongly agree’; **bold** = highest score, *italic* = lowest score.

3.1. Passive consumers (14.7%) – precontemplation stage

The majority of passive consumers are meat-eaters, consuming meat more than 7 meals per week ([Tables 3 and 4](#)), have a more positive

**Table 10**  
Reasons for potential behaviour change regarding meat consumption.

If, in the future, you decide to reduce meat consumption, what could be the reasons?	Passive	Curious	Awoken	Active
Reduction of health risks.	2.81*	2.50*	3.79**	<b>4.12***</b>
Concern about the environment and conserving resources for future generations.	3.62***	3.33*	4.64	<b>5.77***</b>
Concern and compassion with the animals.	2.49**	1.67***	3.41*	<b>4.62***</b>
Strong scientific evidence.	3.68	3.11	4.25	<b>4.57**</b>
Visible benefits.	3.58	2.44*	4.39**	<b>4.47**</b>
Satisfaction with alternatives.	3.79	3.67	4.47	<b>4.67*</b>

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001  
<sup>1</sup> Mean scores on a six-point Likert scale, 1 = ‘strongly disagree’ to 6 = ‘strongly agree’; **bold** = highest score, *italic* = lowest score.

**Table 11**  
Attitudes towards practical interventions to reduce meat consumption.

How strongly do you agree with the following ideas?	Passive	Curious	Awoken	Active
Implementation of one meatless day per week.	3.83	3.90	4.53	<b>5.05**</b>
Obligatory offer of meatless food in restaurants and cafeterias.	3.14***	3.91	4.14	<b>5.26***</b>
Ban on meat advertising.	1.61***	2.36	2.21	<b>3.42***</b>
Reduction of livestock production.	2.61***	3.30	3.65	<b>5.12***</b>
Reduction of hunting.	2.18**	2.42	2.84	<b>3.44***</b>
Reduction of fishing.	2.63***	3.00	3.51	<b>4.51***</b>
Higher taxation of meat.	1.85***	2.82	3.01	<b>4.54***</b>
Subsidising plant-based alternatives.	2.74**	2.50*	3.53	<b>4.54***</b>
Meat reduction in school menus and cafeterias.	2.94***	3.27	4.03	<b>5.33***</b>
Better education of students and population.	3.82**	3.82	4.76	<b>5.71***</b>
Raise awareness of the consequences of eating meat.	3.59**	3.60	4.67	<b>5.72***</b>
Clinical nutrition without meat.	1.90***	2.70	2.83	<b>4.16***</b>
Educating producers regarding new or alternative food production.	3.08**	2.73*	4.10	<b>5.06***</b>
Support via expert counselling for nutrition.	2.39***	2.70	3.15	<b>3.98***</b>
Educating nutrition counsellors.	2.54***	2.70	3.38	<b>4.25***</b>
Improvement of animal welfare/rights.	3.21**	3.64	4.05	<b>5.11***</b>

Notes: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001.  
<sup>1</sup> Mean scores on a six-point Likert scale, 1 = ‘strongly disagree’ to 6 = ‘strongly agree’; **bold** = highest score, *italic* = lowest score.

attitude towards meat ([Table 6](#)), and have more concerns with eating a plant-based diet, especially when it comes to their personal health and preferences ([Table 7](#)). The largest proportion of them still lives with their parents ([Table 2](#)) and rarely engages in discussions with other people regarding meat reduction. They rarely consume meat alternatives ([Table 4](#)) and are unsure about what characteristics a meat alternative should have ([Table 9](#)). However, motivational factors for behavioural change could be a satisfying meat alternative and their consciousness for the environmental impact of reducing their meat intake ([Table 10](#)). When asked which practical interventions might inspire behavioural change towards meat reduction, many mentioned national-wide policies such as meat taxation, ban on meat advertising, reduction of livestock production and meat reduction in school menus and cafeterias ([Table 11](#)). Therefore, participants in this group clearly know what they want, but when it comes to meat reduction, they are neither interested nor convinced. Their knowledge is satisfactory; still, they choose not to take any action (voluntary inaction).

### 3.2. Curious consumers (6%) – contemplation stage

The curious consumer group includes students that are interested in changes regarding their meat consumption and are willing to take some initiative, but their convictions are not fully formed. Most of the students in this segment consume meat, but almost a third are vegetarians and vegans (Table 3, Table 4). They seem to be aware of the benefits of a plant-based diet, especially the health benefits (Table 7). The main barriers to eating a plant-based diet are health concerns as well as the lack of availability and convenience (Table 7). Possible drivers of change are concerns for and compassion with animals, the environmental impact of meat consumption and a higher general acceptance of plant-based foods in terms of appearance and the ability to easily combine meat alternatives with other foods (Table 9). However, most people in this cluster will probably not agree with the proposed practical intervention except subsidising meat alternatives and educating food producers (Table 11). Although this group is hesitant and does not have a strong opinion on meat reduction, it is nonetheless curious.

### 3.3. Awoken consumers (44.7%) – preparation stage

The awoken consumers are the largest group in this study. Most of them are meat eaters because they enjoy cooking with meat and its sensory characteristics. However, at least part of them acknowledge the positive impact of reducing meat in their own diet (Table 4), and some of them have already taken action and reduced their meat consumption (Table 5). Perceived benefits of a plant-based diet outweigh the drawbacks, especially for economic reasons and convenience (Table 7). Taste remains the dominant influential factor when deciding upon food products, although this group makes a final decision considering several factors (Table 8). A meat alternative would be an option for them if it was reasonably priced and could be easily integrated and combined in meals (Table 9). Even though they are more motivated to reduce their meat consumption than the ‘curious’ group, they also rarely engage in discussions about meat consumption. Factors that might help their transition towards action are a possible reduction of health risks, concern for animals, and visible benefits from their behavioural change (Table 10). Practical interventions that receive their highest approval include a better education of the general population as well as raising awareness, combined with the gradual reduction of overall meat consumption (e.g. the implementation of one meatless day per week) (Table 11). Although this group of students is prepared for this dietary shift and takes active steps towards meat reduction, they yet lack the consistency and commitment to make this change in behaviour part of their daily lives.

### 3.4. Active consumers (34.6%) – action/maintenance stage

Active consumers have already identified the benefits of change, committed to change, and prepared a plan that fits their lifestyle. This is proven by the fact that more than half of them reduced their meat consumption after coming to university (Table 5). The highest proportion in this cluster are flexitarians, and a third are vegetarians or vegans (Table 3). Their attitudes towards meat consumption are completely defined and heavily influenced by pro-health and ethical arguments (Table 5, Table 6). They strongly believe in the health and ethical benefits of a plant-based diet, while disregarding its barriers (Table 7). The factors of influence in the decision-making process are clearly determined—personal beliefs and product origin are the most important influencing factors (Table 8). Meat alternatives are acceptable for this group if they are completely different from meat, can be easily integrated and combined in meals, are reasonably priced and contain healthy nutrients (Table 9). The level of interest in and sharing of information regarding the topic is higher than in the other three segments, however not significantly different. Their main reasons for implementing this behavioural change are a concern for the environment and care

for natural resources, including a strong scientific evidence in favour of reducing meat consumption, satisfaction with alternatives and concern for animal welfare (Table 10). They are also open to most of the proposed practical interventions. To be more precise, they approve the most of better educating students and the population and sensitizing them to the consequences of meat consumption (Table 11).

## 4. Discussion

The identification of four distinct profiles/clusters regarding meat consumption and reduction allows for a better understanding of the meat consumption patterns and behaviour in different stages of the TTM. The study illuminates the importance of designing target-group and stage-specific interventions when encouraging a shift towards a plant-based diet. So far, the TTM has been applied in a diverse set of studies regarding sustainable consumption (Barbieri et al., 2009; Hielkema & Lund, 2021; Klöckner, 2017; Lea et al., 2006a). Additionally, many studies investigated the intention-behaviour gap regarding meat consumption (de Bakker & Dagevos, 2012; Stoll-Kleemann & Schmidt, 2017; Tobler et al., 2011; Verain et al., 2017). However, none of these studies provided a complete and detailed overview and description of variables associated with meat consumption nor has attempted to integrate this many items in one study, especially with a specific focus on the population group of Swiss students—a group with high transformational potential to change consumer behaviour regarding meat.

One of the main findings of this study is the large share of respondents in the preparation and maintenance/action stages, similar to the study of Tobler et al. (2011), who also analysed the Swiss situation. Even though this might be partly due to the fact that the variables defining the stage of change are based on self-reflection, there is a consistency and similarity of answers within each segment of the population. This is aligned with the latest data on Swiss dietary patterns (Krieger et al., 2019). Even though the Western diet is still strongly represented in the population with a high consumption of red and processed meat, an increasing proportion of the population is reducing its meat intake. According to the findings in Table 8, habits, taste and texture remain some of the main reasons for meat consumption, especially for passive and curious consumers, suggesting that routines are very important in everyday consumption. Several authors highlight the influence of habits on meat reduction (Dagevos & Voordouw, 2013; Götze & Brunner, 2021; Graça, Oliveira, & Calheiros, 2015; Klöckner & Blöbaum, 2010). On the other hand, according to this study, and the data for the Swiss population (Statista, 2017), young people are not only driven by habits and are generally more open to flexitarian eating, suggesting a generational shift in attitudes and behaviour in meat consumption. However, even though students remain a flexible group, this study also shows that passive consumers who did not reduce meat consumption yet and still live with their parents might indicate that tradition is present and is part of their decision-making process. This only further proves that passive consumers should be targeted using a diverse set of interventions simultaneously, explained more in detail in the recommendations section.

Pro-environmental attitudes among respondents dominate throughout the diverse set of items, followed by compassion for the animals and personal health concerns. According to Wyker and Davison (2010), people who are aware of the environmental benefits of eating less meat have better control when carrying out this behaviour than those who still contemplate it. Health concerns are also important for passive and curious consumers, as also analysed by Cordts, Spiller, Nitzko, Grethe, & Duman (2013); Dibb & Fitzpatrick (2014); Götze & Brunner (2021); Tobler et al. (2011). According to this, these consumers find it difficult to change their habitual perspective that meat is essential for maintaining health and that vegetarian diets lack nutrients. This is further proven by this study, where even active consumers highly rate the necessity of useful nutrients in meat alternatives.

The results of this study further hint that the decision-making process

regarding meat is complex. Students evaluate decisions according to multiple factors in which emotional and social components have a significant influence. The highest ranked factor in each of the segments is taste, which aligns with many studies already conducted (Font-I-Furnols & Guerrero, 2014; Glanz et al., 1998; Götze & Brunner, 2021; Graça, Calheiros, & Oliveira, 2015; Mancini & Antonioli, 2019; Steptoe, Pollard, & Wardle, 1995). Based on these findings, new product development of meat alternatives can consider the desired characteristics of such a product.

The responses have several other interesting elements. First, although students are presumed to be a consistent and highly communicative population group, the initiation of discussions was rather low (from once a year to once every few months). This might be due to the cultural aspect of Switzerland (restraint with regard to conflicting issues) and the different language regions, where there is significant influence from the neighbouring countries, France, Italy, Austria, and Germany (Krieger et al., 2019). Correspondingly, more research is needed to learn how to empower each of the segments to effectively make sustained and long-lasting changes in their meat consumption behaviour and how to inspire discussion and interest in the topic. Second, familiarity with meat alternatives was higher than expected, and food neophobia was not a major barrier towards eating meat alternatives. This is most likely due to the fact that the market for meat alternatives has grown in popularity in recent years; this provides infrastructural opportunities to help consumers shift towards flexitarian eating (Schösler, de Boer, & Boersema, 2012). Another part of the study that was particularly thought-provoking was that a third of the consumers in the curious group declared they were vegetarians and vegans. A possible explanation for this discrepancy might be the size of the cluster. It also cannot be ruled out that at least a part of the people in this group only (temporarily or partially) follows a currently popular trend but is not deeply convinced of this lifestyle. As in the study of Tobler et al. (2011), this might suggest that the transition over the different stages can happen easily, relapse can also happen and the encountered barriers should not be ignored. Finally, there was a great diversity in attitudes to the proposed practical interventions. This was to be expected since there was stage model categorization. Therefore, the following recommendations will focus on shedding light on what can be done to persuade consumers in the different stages of change (Stoll-Kleemann & Schmidt, 2017).

#### 4.1. Recommendations for practical interventions

It is important to note that long-term changes in dietary practices and daily routines are very hard to achieve. A coevolutionary change of social norms that also encompasses individual norms is required (Reynolds, Subašić, & Tindall, 2015). It is therefore necessary to employ effective means to encourage a shift towards a reduction in meat consumption to enable a more efficient transition to a sustainable food system. For instance, consumers in the precontemplation stage (passive consumers) would benefit most from a gradual change with an active role of the government. This could, for example, involve the initiation of higher meat taxation, the reduction of meat production and the introduction of meat-free days in community catering. The promotion of a knowledge-based society sharing and exchanging information on meat reduction seems promising for this segment. Specially trained health professionals (nutritionists) are another option for achieving dietary change because they can teach skills regarding cooking, food choice, preparation and combination of products, which is an important aspect of achieving a more sustainable, plant-based diet (Garcia, Reardon, McDonald, & Vargas-Garcia, 2016). Interventions aiming to improve food literacy can have positive benefits for passive consumers when it comes to limiting meat consumption (Glanz, Hewitt, & Rudd, 1992). School-based interventions such as *Meat Free Monday (2020)* which promote a healthy, balanced diet, have proven to be successful and are therefore also an interesting option (de Boer et al., 2014; *Meat Free*

*Monday, 2020*; Rojas et al., 2011).

Strategies for curious consumers (contemplators) should consider practical models from institutions (e.g. the government, non-governmental organizations [NGOs], schools), the right infrastructure, and regulations. For example, these can advocate for the convincing of this demographic group. NGOs may act as bridges between consumers and policy makers both in raising awareness for the need for a dietary change and advocating for policy reforms on this issue (Laestadius, Neff, Barry, & Frattaroli, 2014). In addition, conscious consumers can play a significant role as supporters in this transition process (de Bakker & Dagevos, 2012). However, when involving NGOs for campaigns, the role of the government should not be forgotten, since they have significant power to directly affect markets (Lang & Barling, 2013).

For consumers that are considered awoken (preparation stage), measures should be taken to ensure the availability of meat alternatives, designing practical guidance on combining plant-based alternatives in meals and providing education on culinary skills. Here, retail businesses and healthy food production companies can play an important role. Using nudging strategies and point-of-purchase actions could decrease the demand for meat products and further promote the market for meat alternatives (Graça, 2016; Hoek et al., 2011; Mancino, Guthrie, & Just, 2018). Thus, when developing and launching meat alternatives, important aspects to consider are product marketing, positioning and distribution (Graça, Oliveira, & Calheiros, 2015). For meat alternatives to be successful on the market, it will be crucial that consumers no longer see those products as inferior substitutes but stand-alone products. Therefore, one of the most important challenges in product development will be to create alternatives that are not only tasty but also offer a nutritional value equivalent to meat.

For active consumers who are already eating sustainably, concrete implementation advice is recommended as well as social support to increase the likelihood that they will continue in doing so (e.g. being part of vegetarian or vegan communities). Certainly, continuous accessibility and improvement of meat alternatives is imperative to ensure intake of the essential nutrients.

Even though tailored measures have proven to be successful, it is also important to mention the measures that can be employed to target all the segments simultaneously. For instance, efforts to dissuade the population from consuming unhealthy products can present a valuable learning opportunity, particularly on the use of health-focused messaging to change habits (Wellesley, Happer, & Froggart, 2015). Labelling frameworks are often used to inform consumers about the calories, sugar, fat and salt content of a product (Grunert, Hieke, & Wills, 2014; Moon, Balasubramanian, & Rimal, 2011). Labels on meat products that refer to, for example, their carbon footprint, health risks or product origin may be introduced to improve traceability and transparency of the whole supply chain and thereby may also raise awareness on the consumer side.

Informing consumers should be also the focus of marketing campaigns employed by the food industry to nudge consumers to purchase certain products and refrain from purchasing others. Employing typical campaign strategies to encourage reduced meat consumption is a challenging mission, since food choices are typically driven by routine and subconscious decisions (Bailey & Harper, 2015; Van Loo, Hoefkens, & Verbeke, 2017). Whether marketing is viewed as 'pushing' products or in a new sense as 'customer satisfaction engineering', it remains widespread in society and affects everyday lives, specifically consumer choices (Bogueva, Marinova, & Raphaely, 2017; Evans, 2006). Therefore, future communication strategies need to generate interest in and attention towards the topic, formulate a commitment for meat reduction regarding the stage, i.e. encourage passive consumers to try vegetarian meals once or twice a week, curious consumers to become flexitarians, awoken consumers to personally commit for change and active consumers to inspire global changes (Johanning, 2015). So far, positive marketing campaigns include 'Less Meat, Less Heat', 'The Reducetarian Movement' and 'Living The Change'.

Ultimately, the above-mentioned measures and interventions require that the development of meat-reduction strategies involve multi-stakeholder cooperation between producers, processors, retailers, consumers, civil society organizations and policy makers (Sutton & Dibb, 2013).

#### 4.2. Limitations and further research ideas

In general, when conducting surveys, phenomena such as under-reporting (e.g. in this study, a lower meat consumption than actually) may occur. Hence, self-reported behaviour may differ from actual behaviour (Rosenman, Tennekoon, & Hill, 2011). The segmentation of the student population into stages of behavioural change shows a rather self-reflected image of the behaviour that defines each of the segments. Therefore, further research might be useful to verify the results found in this study, e.g. through the use of food diaries.

The results of this research should be viewed with care as the study's target group covers only part of the Swiss population, students. Attitudes from this part of the general population (i.e. students) might therefore differ from the overall population behaviour and studies in this format for other target groups such as other adults are required in the future to better understand the needs of all consumers in Switzerland.

The stage model (TTM) is sometimes criticized for its lack of clear distinction between stages. Therefore, further research on each of the identified consumer groups (stages of the TTM) might give a more detailed picture on their consumption needs and intentions. The stage model was adapted to fit the research questions of this study, and the stage categorization is based on one multi-item question. It cannot be excluded, and this could serve as the subject of future studies, that the stages overlap in some way. Also, it cannot be ignored that certain consumers might relapse (i.e. eat meat again and shift from the action/maintenance stage to the precontemplation or contemplation stage) as consumer behaviour is complex and not static, hence it changes over time (Littell & Girvin, 2002). Also, it cannot be ruled out that certain vegans and vegetarians abstain from meat for reasons other than those queried in the survey, e.g. because they simply do not like the taste of meat. Possibly they also only temporarily or partially abstain from meat, as mentioned above. Those tendencies could not fully be explored in this study but would be insightful in the future.

## 5. Conclusions

Based on the scientific consensus that current meat consumption has negative impacts on the environment as well as on animal welfare and human health (among others), this paper examined the willingness of Swiss students to reduce their meat consumption. By segmenting the student population, the aim was to identify the current stages of behavioural change in this population group, which could play a pioneering role in developing more sustainable consumption patterns in the future.

It is crucial to emphasise the need for concrete and quantifiable goals with specific time frames in order to reduce meat consumption. In addition, studies should be conducted to investigate the indicators analysed in this paper: the current status of change in different segments of the population and their willingness to move to the next phase of behaviour (e.g. from preparation to action) as well as barriers to and motivational drivers of change. Simultaneously, improving the product variety of meat alternatives in terms of nutritional value, sensory characteristics, accessibility and price are key factors in changing meat consumption behaviour.

It is also important to acknowledge that the dramatic and acute impacts of unrestrained meat consumption are too large for the process of transition to be underestimated, delayed and left unguided. Therefore, future research should focus on examining why this topic is not more on the 'menu' of discussion among young adults and why it is not sufficiently valorised in politics. Another aspect that should be attended to is the targeting of different segments of the population and designing specific strategies for behavioural change. Finally, the evaluation of already existing interventions that can serve as a basis for more personalised, innovative and clear communication of future measures will be critical to success.

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## Declarations of interest

None.

## Appendix A. Items used for the assessment of knowledge, attitudes, and beliefs regarding meat consumption

Pro-meat	Source <sup>*</sup>
Cronbach's $\alpha$ : 0.92	
I believe in the nutritional benefits of animal-based products.	Sigle (2016)
Eating meat is beneficial, as it is found in the food pyramid.	Sigle (2016)
Modern agricultural systems take care of meat safety.	Sigle (2016)
Meat must be necessary since institutions advise people to eat meat.	Sigle (2016)
If my parents and ancestors ate meat, why would I not?	Heuer (2014); Springer (2013)
I have culinary skills in preparing meat.	Clonan et al. (2016)
I eat meat because it is the most important part of a meal.	Heuer (2014); Springer (2013)
Manufacturers have the right to earn money, as they have invested in the meat industry.	Clonan et al. (2016); Vinnari and Vinnari (2014)
Livestock production and the meat industry are necessary for the economy in a country.	Clonan et al. (2016); Vinnari and Vinnari (2014)
I eat meat because it is part of my identity.	Clonan et al. (2016); Vinnari and Vinnari (2014)
People have always eaten meat, therefore I also do.	Clonan et al. (2016); Vinnari and Vinnari (2014)
I eat meat because it is generally accepted.	Frank et al. (2017)
I eat meat because it has a structure like no other food source.	Frank et al. (2017)
I eat meat because it is the only one that contains all 9 essential amino acids.	Frank et al. (2017)
I eat meat because it is the only food containing vitamin B12 and omega 3.	Frank et al. (2017)
I eat meat because it has a unique texture and consistency.	Frank et al. (2017)
Cooked meat provides extreme sensory pleasure.	Frank et al. (2017)
Eating meat makes me full.	Frank et al. (2017)
I eat meat because eating meat is modern.	Clonan et al. (2016); Santos and Booth (1996)
I eat meat because eating meat is synonymous with a high standard of living.	Clonan et al. (2016); Santos and Booth (1996)
I eat meat because eating meat is a natural need.	Clonan et al. (2016); Santos and Booth (1996)

(continued on next page)



(continued)

Pro-meat	Source <sup>‡</sup>
Notes: Items were queried on a six-point Likert scale (from 1 = 'strongly disagree' to 6 = 'strongly agree').	
<sup>‡</sup> Statements are based on the indicated source and were partly adjusted to fit the purpose of the study.	
Contra-meat	Source <sup>‡</sup>
Cronbach's $\alpha$ : 0.91	
People who eat meat have a higher risk for cancer and cardiovascular diseases.	de Boer et al. (2017); Clonan et al. (2015)
A balanced nutrition is more important than the taste of meat.	de Boer et al. (2017); Clonan et al. (2015)
Eating meat is unhealthy because it is high in saturated fats and cholesterol.	de Boer et al., 2017; Clonan et al. (2015)
Eating meat is unhealthy because it can be contaminated with harmful bacteria.	de Boer et al. (2017); Clonan et al. (2015)
Eating meat is unhealthy because it can contain antibiotics and hormones.	de Boer et al. (2017); Clonan et al. (2015)
Eating grilled meat is unhealthy because of carcinogenic substances.	de Boer et al., 2017; Clonan et al. (2015)
Eating processed meat is unhealthy because it can contain nitrates and nitrites.	de Boer et al. (2017); Clonan et al. (2015)
I try to avoid eating meat because emissions from livestock production account for app. 40% of all greenhouse gases.	Frank et al. (2017)
I try to avoid eating meat because livestock production causes water scarcity.	Frank et al. (2017)
I try to avoid eating meat because energy use for meat production is too high.	Frank et al. (2017)
I try to avoid eating meat because livestock production uses more than 78% of total agricultural land.	Frank et al. (2017)
I try to avoid eating meat because farm animals are no different than pets and should not be used as food.	Vinnari and Vinnari (2014)
I try to avoid eating meat because farm animals should have the same rights as humans.	Vinnari and Vinnari (2014)
I try to avoid eating meat because animals are fundamentally connected with people and should therefore not be eaten.	Vinnari and Vinnari (2014)
Notes: Items were queried on a six-point Likert scale (1 = 'strongly disagree' to 6 = 'strongly agree').	
<sup>‡</sup> Statements are based on the indicated source and were partly adjusted to fit the purpose of the study.	

**Appendix B. Items used for the principal component analysis and the assessment of perceived benefits and difficulties of a plant-based diet (Lea et al., 2006a, 2006b; Lea & Worsley, 2008)<sup>1</sup>**

Perceived benefits	
Some people believe that eating a plant-based diet has specific benefits. How much do these statements apply to you?	
A diet without meat (and fish) is beneficial because ...	
Factors and items	Factor loadings
Factor 1. Health benefits	
Eigenvalue: 7.6	
Cronbach's $\alpha$ : 0.92	
Total variance: 47.6%	
... I have plenty of energy.	0.79
... I stay healthy.	0.78
... it improves my digestion.	0.74
... I eat lots of vitamins and minerals.	0.73
... I eat a tasty diet.	0.73
... I eat a vast variety of foods.	0.72
... I eat a more 'natural' diet.	0.72
... I control my weight.	0.71
... I prevent disease in general (e.g. cardiovascular diseases, cancer).	0.64
... it decreases my intake of saturated fats.	0.55
Factor 2. Ethical reasons	
Eigenvalue: 1.55	
Cronbach's $\alpha$ : 0.85	
Total variance: 9.7%	
... it supports efficiency of food production.	0.80
... it helps the environment.	0.78
... it decreases hunger in the Third World.	0.78
... it helps animal welfare/rights.	0.74
Factor 3. Economic benefits and convenience	
Eigenvalue: 1.17	
Cronbach's $\alpha$ : 0.66	
Total variance: 7.3%	
... it saves time.	0.83
... it saves money.	0.80
Notes: Items were queried on a six-point Likert scale (1 = 'strongly disagree' to 6 = 'strongly agree').	
Perceived difficulties	
Some people believe that eating a plant-based diet has specific difficulties.	
How much do these statements apply to you?	
Factors and items	Factor loadings
Factor 1. Health concerns and preferences	

(continued on next page)

<sup>1</sup> All statements were paraphrased from the indicated studies (sources) to fit the current study.

(continued)

Factors and items	Factor loadings
Perceived difficulties	
Some people believe that eating a plant-based diet has specific difficulties.	
How much do these statements apply to you?	
Eigenvalue: 4.83	
Cronbach's $\alpha$ : 0.84	
Total variance: 40.3%	
A plant-based diet would not be filling enough.	0.81
There is not enough iron in plant-based meals.	0.79
There is not enough protein in plants.	0.79
A plant-based diet provokes indigestion, bloating, gas or flatulence.	0.68
I do not want to eat so many plant-based meals.	0.67
I do not want to change my eating habits/routine.	0.59
Factor 2. Availability and convenience	
Eigenvalue: 1.6	
Cronbach's $\alpha$ : 0.73	
Total variance: 13%	
Plant-based meals are not available in my shop, canteen or at home.	0.83
Plant-based meals are not or hardly available when I eat out.	0.80
It takes too long to prepare plant-based meals.	0.60
I do not know how to prepare plant-based meals.	0.50
Factor 3. Food neophobia	
Eigenvalue: 1.13	
Cronbach's $\alpha$ : 0.80	
Total variance: 9.4%	
I am afraid of new foods.	0.88
I do not want to eat strange or unusual foods.	0.84

Notes: Items were queried on a six-point Likert scale (1 = 'strongly disagree' to 6 = 'strongly agree').

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