

Overcoming consumption barriers for conscious food products: The influence of sustainability and health-related product information on sensory acceptance differentiated according to diets

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# **Overcoming consumption barriers for conscious food products: The influence of sustainability and health-related product information on sensory acceptance differentiated according to diets**

## **Abstract:**

The aim of this paper is to ascertain, in which way information regarding sustainability and health-related aspects of a newly developed and sustainable food-product is capable of influencing the sensory acceptance of consumers following different diets. To answer these research questions, a hedonic sensory evaluation was conducted. 80 omnivorous, as well as 107 plant-based dieters were questioned and separated into control- and experimental groups. As stimuli a newly developed snack-product, was presented to the participants. The results show that the product concept does significantly influence the sensory acceptance, indicating a “halo-effect” of the presented sustainability- and health-related product-information.

*Keywords: conscious consumption, plant-based, halo-effect*

*Track: Social Responsibility & Ethics*

## **1 Introduction of the paper**

The number of people who change their diet and prefer a predominantly plant-based diet to the traditional mixed diet is steadily increasing. The number of vegan and vegetarian people in Middle Europe was around eight percent in 2019, and flexitarians, who only eat meat occasionally, was even 17 percent. (KeyQUEST, 2020) The reasons for turning away from animal products are diverse. In addition to animal welfare, ecological or environmental impacts as well as the health benefits of food are particularly important for many people. (Kirsten, Seib-Pfeifer, Lüth, and Rosenfeld 2020)

To what extent these decision criteria, why consumers change their entire lifestyle, and the way in which they evaluate and consume new foods, has been researched sufficient so far. The same applies to the question of how strongly omnivores are influenced by health and sustainability-related information in their sensory assessment. According to some studies, price and taste of the consumed products tend to be more important for those consumer group than others reasons. (Malek & Umberger, 2021)

This is particularly interesting given that the growing awareness of sustainability across Europe (McKinsey, 2021), the increased social awareness of the issue of climate change and the increased "moral consumption" of a growing group of consumers. (KeyQUEST, 2020) Individual values and worldviews have been shown to have a significant influence on the sensory evaluation of food. (Mora, Romeo-Arroyoa, Torán-Pereg, Chaya, and Vázquez-Araújo, 2020)

## **2 Different forms of nutrition and their motives**

According to a publication in the year 2021, there is an increased awareness of the environmental pollution with regard to the purchased products and the resulting issue of the ecological footprint or, especially in the group of people with a plant-based diet or a diet variant in which animal products are consciously avoided or reduced. (Malek & Umberger, 2021) In addition to environmental issues, animal welfare is a very important factor for vegans and vegetarians when choosing their food, while for omnivorous people, the focus is primarily on the taste of the food. (Kirsten et al., 2020)

In order to differentiate between the individual consumer groups, the following delimitations can be set: Omnivores are defined as people who do not follow any set limits with regard to the consumption of animal foods. Flexitarians do consume animal products and meat,

but consciously try to reduce this consumption. (Cliceri, Spinelli, Dinnella, Prescott, and Monteleone, 2018) Vegetarians consciously avoid meat and partially other animal products. Vegans generally avoid all food of animal origin. (Tuorila & Hartmann, 2020) It should be noted here that the boundaries between the various nutritional categories are sometimes blurred.

Reasons for preferring vegetarian and vegan foods are environmental care, the rejection of meat, the expected higher health benefits as well as moral and ethical motives. (Tuorila & Hartmann, 2020) These findings go far with those of a nutrition survey published by the “Veganz” brand, which was carried out in 2019 with a total of 24.000 european test persons. In this online survey, animal welfare (95 percent of respondents), the environment (83.9 percent of respondents) and health aspects (55.9 percent of respondents) were also identified as the three main arguments of the reasons for choosing a vegan lifestyle. "Sustainability and environmental protection" were named by 86 percent of the vegan respondents as the most important criterion when shopping for food. (Veganz, 2019.)

For people who decide to limit their meat consumption (flexitarians), “egotistical” motives seem to be more decisive when choosing food than for vegetarians and vegans, although most of the motives of these groups are very similar. These “egotistical” motives include taste, health benefits, price, familiarity, and convenience, which were most pronounced in people with omnivore diets. Flexitarians seem to represent an interface between vegetarians or vegans and mixed dieters, whereby the similarities with people with a plant-based diet seem to be stronger. (Malek & Umberger, 2021) In some publications, people who opt for the vegan diet primarily for health reasons are referred to as "health vegans", those who have ethical reasons as "ideological vegans". However, there seem to be major points of overlap between these two groups, which makes a clear distinction not possible. (Heiss, Coffino, and Hormes, 2017)

Due to the blurring of boundaries between vegan, vegetarian and flexitarian forms of diet as well as the overlaps between flexitarians and vegetarians/vegans, these groups are summarized in the following as plant-based dieters and differentiated from omnivorous diet.

### **3 Influence of additional information on the acceptance of food**

Numerous studies were found that determine the influence of product-specific information on the purchase decision as well as the sensory evaluation of different products. In some of these publications, a “halo-effect” of health-related information or an “eco-label-effect” of sustainability and ecology-related information can be observed on the panelists. Thus, the

information can partially have a placebo effect on the taste perception and sensory acceptance of the test subjects. (Sörqvist, Langeborg, and Marsh, 2016)

### *3.1 Health and Quality Information*

In many existing studies, a significant influence of additional information on the sensory perception (and willingness to buy) of the respective test persons could be demonstrated. In some cases, however, only selected product information resulted in significant differences. In a study in which the influence of information on the fat and sugar content of low-calorie yoghurt was analyzed, a significantly positive effect on the acceptance of the samples by health-conscious test persons who received information about the reduced sugar content was observed. On the other hand, information on the reduced fat content of the samples again had no effect on acceptance by the consumers. (Johansen, Naes, Øyaas, and Hersleth, 2010)

In a coffee study of 2020, a significant difference was also found when comparing the blind acceptance test and the acceptance test in combination with the quality-related information. Compared with the blind test, the information had a significant effect on the more intensive perception and more positive assessment of appearance, odor, taste attributes and overall acceptance. Those types of coffee that the manufacturers described as being of higher quality were also rated significantly better, while the blind tasting showed no significant differences in overall acceptance and taste attributes. (Bemfeito et al., 2020)

According to the results published here, the acceptance of products can therefore only be influenced to a certain extent by information, but a basic, appealing sensory system must always be present and tends to have a greater influence on the overall acceptance of the products than the additional information. (Carillo, Varela, and Fiszman, 2012)

### *3.2 Ethical and sustainability-related information*

In addition to information on ingredients and health benefits of products, the effect of ethical and sustainability-related information on the taste perception and acceptance of various products has already been checked several times. Particularly in these subject areas, the individual attitude seems to have a major effect on the "ability to be influenced" by such information, since test persons with a strong interest in environmental and sustainability topics tend to be more responsive to stimuli such as the "use of by-products" or "avoiding food waste". (Mora et al., 2020) The influence of sustainability-related information on (sensory) acceptance has already been examined many times, especially in the meat substitute and insect products

segment. Schouteten et al. for example, achieving a significantly positive influence on the overall acceptance of insect burgers by providing information on the safety and sustainability of the products in advance. (Schouteten et al., 2016)

### 3.3 *Objective and research questions*

It has not yet been ascertained whether omnivorous differ significantly in their ability to be influenced or their sensory perceptions after being given information from persons with a plant-based diet. Indications that health or sustainability issues can represent important influencing factors in the evaluation of products can already be found in a large number of publications. (Kongstad & Giacalone, 2020; Silva, Sodre Bioto, Efraim, and de Castilho Queiroz, 2017) The aim of this work is to examine the possible role of the chosen diet on the informed/uninformed assessment.

In advance, and based on the literature research, the assumption was made that people with a plant-based diet are more interested in the topics of sustainability and the use of by-products as well as the avoidance of food waste, and that their individual acceptance of new products with similar claims are influenced.

Q1: In what way does a product concept, highlighting the ecological & health related USP's of a vegan snack product made of oilseed cake, influence the sensory acceptance of said product?

H<sub>0</sub>: The product concept does not significantly influence the acceptance of the product.

H<sub>1</sub>: The product concept has significant influence on the acceptance of the product.

Q2: In what way does the individual dietary pattern (omnivorous versus plant-based/flexitarian diet) influence the sensory acceptance of a vegan snack product made of oilseed cake?

H<sub>0</sub>: The dietary pattern does not significantly influence the acceptance of the product.

H<sub>1</sub>: Subjects following a plant-based dieters are significantly differently accepting of the product when combined with the product concept.

## 4 Empirical work

### 4.1 Study design

In order to test our hypotheses, the product prototypes were tasted by four groups of test persons (39 omnivores with a product concept (including information on the utilization of a high-protein residue from food production and the associated health and sustainable benefits), 41 omnivores without a concept, 61 plant-based dieters with a concept, 46 plant-based dieters without a concept) as part of a hedonic-sensory test, visualized in table 1. During this tasting, apart from the acceptance of the products, differences between the preferences and the effect of the information provision in the various nutritional groups should be determined.

Since only half of the respondents received the product concept for review due to the pseudo-experimental design, the direct influence of the additional information on the acceptance of the test persons can be assessed. In this way, conclusions can be drawn about the influence of health and sustainability-related information on the acceptance of new products in the various nutritional categories. In addition, it can be ascertained to what extent omnivores and plant-based dieters differ in their sensory influenceability with regard to this marketing information for new products.

Table 1: Study design

		within-subject	
		form of diet	
between-subject	control-group	group 3 omnivores without a concept, n=41	group 4 plant-based dieters without a concept, n=46
	experimental-group	group 1 omnivores with a concept, n=39	group 2 plant-based dieters with a concept, n=61

### 4.2 Stimuli

Due to the increasing demand for products with a health benefit and the trend towards small snacks and snacks instead of large main meals (Rützler, 2021), the product category of snack products was chosen as a tasting stimulus. The said prototypes are vegan, high in protein based on oil press cakes (linseed press cakes and pumpkin seed press cakes), which

are specially tailored to the needs of the target groups of people with a plant-based diet and flexitarians.

The choice of stimuli should offer ecological added value and not lead to any aversions in the test persons, so that it can be used to check the effect of sustainability and health-related information in the form of a short concept on the individual sensory acceptance of people with different diets.

Due to the prevailing corona pandemic and the associated measures and restrictions, the acceptance test and concept assessment were carried out online in the “home use setting”.

### 4.3 Data analysis

The study was analyzed with various ANOVA's and Benjamini-Hochberg post-hoc-test, whereby the submission of the additional information serves as between-subjects factor and the type of diet as within-subjects factor.

## 5 Major results and general discussion

As can be seen in the illustration below, the evaluation in the control group for all attributes turned out to be slightly worse on average than in the experimental group, which was influenced by the concept. With the exception of the variable “odor”, significant differences in the assessment between the groups were found for all variables, which is illustrated by the asterisks in the Figure 1. (test of inter-subject effects:  $F(1, 185) = 21.39$ ;  $p < .001$ ; partial  $\eta^2 = .10$ );

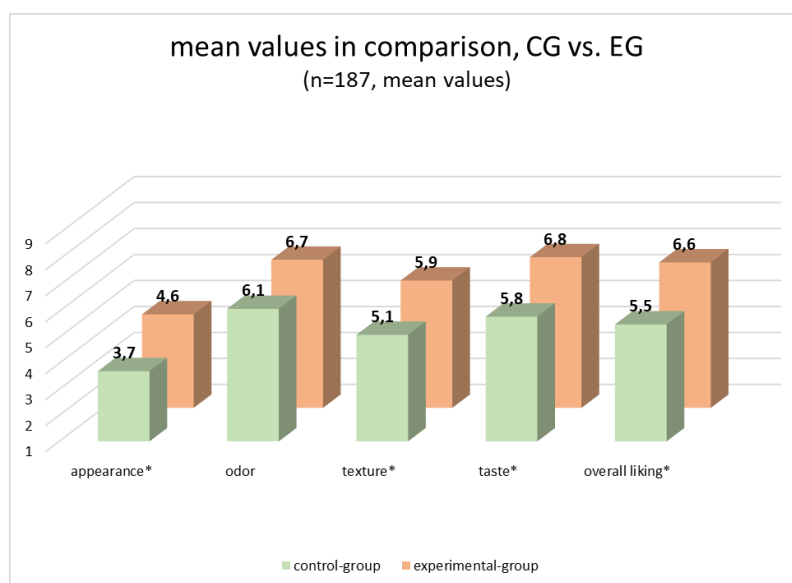


Figure 1: mean values in comparison, CG vs. EG



Although no significant differences could be found between the diets in the experimental and control groups, significant differences were found between the treatment groups in which the respective diet groups seem to differ. The prototype was only rated significantly better by the plant-based dieters in the experimental group than in the control group. (Difference between plant-based dieters (EG) and omnivores (KG): mean difference (I-J) = 1.10,  $p < .001$ ; difference between plant-based dieters (EG) and plant-based dieters (KG): mean difference (I-J) = 1.00,  $p = .001$ ).

Furthermore, the plant-based dieters in the experimental group also achieved the highest evaluations on average for almost all variables.

With regard to the attribute taste, there were significant differences between the two nutritional groups in the experimental group and the group of plant-based dieters in the control group. (difference group one & group four: mean difference (I-J) = 1.05,  $p = .024$ ; difference group two & group four: mean difference (I-J) = 1.27,  $p = .001$ ). However, the plant-based dieters in the experimental group were also distinguished here by the highest average rating.

In the overall assessment, the sample was rated significantly better by the plant-based dieters in the experimental group than was the case in the control group, too (difference in group two & group three: mean difference (I-J) = 1.28,  $p = .001$ ; difference in group two & three group four: mean difference (I-J) = 1.36,  $p < .001$ ). In the case of the omnivorous experimental group, 29 out of 39 people gave a score of six points or higher, which corresponds to a proportion of around 74.4 percent of this group. In the group of plant-based dieters, this proportion was at a very high level at around 80.3 percent (49 out of 61 people). In this group, the acceptance could be reached for both forms of diet, whereby the percentage of total acceptance was again higher in the case of people with a plant-based diet. In the control group, the acceptance was only reached in about 56.1 percent (23 of 41 people) among the omnivores and in a very similar proportion of about 56.5 percent (26 of 46 people) among the plant-based dieters.

As already expected, based on the studies cited in the literature section on the influence of sustainability and health-related product information on the sensory acceptance of consumers, the verbal description of the advantages of the snack products could have a significant influence on the assessment of the prototypes. Correspondingly, in this thesis a clear "halo-effect" of the additional information, and thus a direct influence on the product

perception of the test subjects, can be demonstrated. As described, significant differences between the experimental and control group could not be found for all attributes and subgroups, but for a very large part of the (taste-related) evaluation points. The product concept created can therefore contribute to an improvement in the sensory product perception of new types of snacks based on oil press cakes and could be used effectively for information and advertising purposes in the event of any further development of the products.

## **6 Conclusio and implications for further research**

The results of the sensory acceptance test carried out show that a verbal product description for sustainability and health-related information can significantly positively influence the sensory acceptance of a new type of snack product based on oil press cake. Q1 can therefore be answered clearly. The product concept was able to contribute to a significantly better taste and overall liking compared to the control group, which suggests a "halo-effect" of the information presented.  $H_0$ : "The product concept has no significant influence on acceptance" must therefore be discarded.

Q2, however, has to be answered differently on the basis of the data collected. Since no significant differences in the sample evaluation between the omnivores and plant-based dieters of the experimental group can be demonstrated,  $H_0$  must be maintained. As described, the evaluation by the experimental plant-based dieters differs much more markedly from the control group than is the case with the experimental omnivores, who only differed significantly from the control group in one single attribute evaluation.

The aim of this study was to develop a better understanding of possible differences and similarities between the various diet groups in Austria and thus to make a contribution to diets and sensory research, as well as to the development of more efficient strategies in target group marketing. The results of this work provide informative insights into the sensory perception of people with different diets and provide an impression of the influence that sustainability and health-related product information can have on the acceptance of new products in different target groups. Food producers who are particularly interested in the marketing of protein-rich oil press cake products can use the knowledge gained to better assess the popularity of press cake snacks among the Austrian population and the important role of product and target group-specific marketing. The questions of how the provision of purely ecological information compared to purely health-related information affects the different nutrition groups and to what

extent the various plant-based forms of diet differ in the assessment of food also offer potential for further surveys.

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