Satisfaction level after consumption of animal-based and plant-based products.

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Preface

This report was written as a Bachelor Thesis by Katarzyna Gryżewska. It was written as a final report for her degree in International Food Business at Aeres University of Applied Sciences in Dronten and Dalhousie University in Truro. During writing this thesis, Katarzyna was performing a minor at the Warsaw University of Applied Sciences and her graduation internship in Berlin, Germany.

The research was done to help understand the topic of the connection between food and mood and see which products (meat-based or plant-based alternatives) play the biggest role in how people feel. It is also for companies in the food industry to have a better overview of what impact the product may have on choices and mental health.

The author would like to express gratitude and appreciation toward thesis coach Cynthia Akkermans for the great help and time put into improving this report.

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Table of contents

Summary

Due to growing awareness of nutrition's impact on human health and the environment, more people decide to adopt a sustainable diet. Some decide to become flexitarians, and others stop eating meat completely. It has been also observed that mood plays a big role in influencing eating behaviours. Scientists connect certain foods to mood changes. What people eat, directly affects their palatability.

This research examined the short-term effects of consumption of an animal-based product and plant-based product on mood. The main question of this research was: "How do plant-based alternative foods versus traditional animal-based foods affect the mood and palatability of a consumer?".

Participants of the research were invited to test their overall mood state to check whether they are euphoric, dysphoric or euthymic, and take part in two tastings. To examine the power of perception, the group was informed about which product they consume. Ten moods checked were satisfaction, happiness, energy, alertness, stress, annoyance, nervousness, tension, clear-headedness, and contentment. Those moods were measured on a five-point scale, to check how participants felt at that moment, 1 being 'not at all', 2 'a little', 3 'moderately', 4 'quite a bit' and 5 'extremely'.

The goal was to test the changes in consumers' palatability and mood after consumption of animal- and plant-based product. The levels of ten moods were tested before and after consumption of two products and then compared. The biggest changes before and after consumption of animal-based product were identified for levels of energy (increase), contentment (increase), satisfaction (increase), clear-headedness (decrease), nervousness (decrease) and stress (decrease). For plant-based product the biggest differences were found in levels of energy (increase), satisfaction (decrease), happiness (decrease) and contentment (decrease). Those differences were put next to each other to compare the results and answer the question 'to what extent do people prefer plant-based products over their' animal-based equivalent'.

No significant differences were shown between the mood changes after consumption of animal- versus plant-based product. It can be concluded that there are no clear differences in the influence of those products on the general mood and palatability of a consumer.

Those results show that switching to a plant-based diet is not going to negatively impact the consumer and vegan products can elevate energy and clear-headedness levels. It is advised for the food producers to focus more on the flavour and mouthfeel aspects of their meat-substitute products, as those were the most common points raised by participants.

Chapter 1: *Introduction*

Food is one of the greatest subject matters in every culture, country, and religion. All humans need to eat to survive but eating is also done to show appreciation towards one's heritage as a part of family, tribe, and national traditions. People learn appropriate eating behaviours such as table etiquette, meal and snack patterns and rituals through cultural-based eating habits (Rodriguez, 2021). In the past, the human diet was mostly based on plants, nuts, and seeds. The guts of early humans were not adapted to consume meat. It was not until 2.5 million years ago that the diet started shifting towards an omnivore diet and bodies started gradually adapting to this new eating style (Zaraska, 2016).

1.1. Changes in the human diet

Many changes in the human diet took place, and people have become used to the daily consumption of meat. Their diets started to consist more of animal-based foods such as dairy, eggs, meats, and fish. Nowadays, however it is believed that the (excessive) production of meat is bad for the environment and meat itself is not healthy (Mullee et al., 2017). Some studies also indicate that diets rich in red and processed meats are associated with an increased risk of cardiovascular diseases, cancer, type 2 diabetes, and higher mortality (Qian et al., 2020). It is not a surprise that it causes many concerns about what to consume and more people decide to follow diet plans. As of 2021 half of all Americans followed a prescribed diet (Dunn, 2012). Consumers are becoming more aware of the healthy foods and behavioural intentions that stand behind them. They have a positive attitude toward healthier eating (Joung et al., 2014). Only in the last couple of years due to more knowledge about the relation between food and (gut) health (Dunn, 2012) the awareness of consumers arose, and many people are shifting to plant-based, flexi- and vegetarian diets.

1.2. A shift towards plant-based eating

The rise of vegetarianism and veganism has been tremendous in recent years (Sentient Media, 2021). Restaurants in France, the USA, UK, Australia, South Korea, Switzerland, Japan (Gupta & Gupta, 2021) and other countries started serving only plant-based meals, and clothing and cosmetic brands go vegan too. Whether it is only a trend or a lifestyle there is no doubt that its' popularity is increasing and so is the business. Global brands such as McDonald's, Pizza Hut or Pret-A-Manger were forced to follow those once believed to be fringe movements or short-time diets, also knowns as 'fad diets' (veganism) and create new products to meet the vegan consumer's expectations. The fast-growing social media appearance is also believed to be a result of the young age demographic target group – Millennials and Generation Z - who can create a tremendous increase in the popularity of plant-based foods (Chan, n.d.).

According to data from 2020 released by the Good Food Institute (GFI) and the Plant-Based Food Association, the sales of vegan products in the U.S. increased by 27% and are growing twice as fast as overall food sales. Overall, in the U.S. from 2018 to 2020 plant-based sales grew by 250%. (Pritchett, 2021). What is more, over the past few decades, due to research on

the health effects of meat consumption some contradictory opinions were brought to consumers' and scientists' attention. Even though meat provides several essential nutrients such as protein, iron, zinc, selenium, and vitamin B12 (ThinkBeef.ca, 2021), the study reports that avoiding meat has potential health benefits such as lower cholesterol levels and decreased risk of cardiovascular diseases. Moreover, a vegetarian diet may be more useful in the prevention and treating diseases such as depression, anxiety, and cardiovascular diseases (Dobersek et al., 2020).

Despite this massive popularity, there are also movements against veganism, encouraging people to stop or not even consider going vegan and claiming veganism is not sustainable and unhealthy (Large, 2021). Nevertheless, the short-term positive results of a plant-based diet including beneficial effects on weight status, energy metabolism and inflammation in comparison to a conventional animal-based diet were found in both healthy and obese or type-2 diabetes participants (Medawar et al., 2019), and the restriction in animal-based foods was shown to improve people's mood significantly after two weeks (Beezhold & Johnston, 2012).

1.3. Mood influences on eating behaviours

Mood can be explained as the way of feeling at a particular time. One can be in a good mood when feeling happy, cheerful, positive or in a bad mood when feeling angry, sad, or impatient (Collins English Dictionary, 2021). The connection between food and mood has been observed and studied for a long time. Some of the recognized effects include changes in states of happiness, depression, anxiety, guilt and more. Those effects have been traditionally attributed to nutritional and pharmacological components present in food and personal characteristics (Appleton & Rogers, 2004). On the contrary eating habits or food, habits refer to the way, the reason, the company, and the type of foods people eat. It refers also to different individual, socio-cultural, economic, political, environmental, and religious factors as well as the way people obtain, store, and use foods which all influence their eating habits (Rodriguez, 2021).

According to Carabotti et al. (2014), the gut is an important organ that has digestive and immune functions in the human body. The Gut-brain axis (GBA) or the gut-brain connection which is a connection between the gut and mind plays an important role in communication between the enteric and central nervous systems. It links the emotional and cognitive brain function with peripheral intestinal functions. Psychological characteristics such as emotional eating, depression, neuroticism, and premenstrual dysphoria may predict the impulse to choose certain foods when stressed (Leigh Gibson, 2006). Some findings suggest a negative mood while eating leads to overconsumption, however, this was only shown for women with disinhibited eating past and in connection to the foods they had a desire for (Loxton et al., 2011). Bongers (2013) also mentions the underrated role of overeating while being in a good mood, mostly for emotional eaters. It was found that more food was consumed in a positive mood rather than a neutral mood, and after a negative mood induction, the amount of food eaten decreased. However, after food consumption, the mood increased again (Bongers et al., 2013). Studies mention several eating disorders (e.g., anorexia nervosa, bulimia, binge eating) to have a connection with the relation between food and mood, for example, overeating can be prevented thanks to mindfulness according to Hsu and Forestell (2021).

According to research done by Evers et al. (2013), positive emotions increased caloric intake. A higher number of snacks consumed appeared more frequently while in response to rather positive than negative emotions. In the study, salty snacks and chocolate were compared,

which showed that milk chocolate consumption resulted in a decrease in anxiety in the participants with high anxiety while dark chocolate and crackers with cheese spread caused a decrease in anxiety in participants with low anxiety levels (Martin et al., 2012). In the Macht & Dettmer (2006) study both chocolate and apple were found to reduce hunger and uplift the mood. Despite similar outcomes, the chocolate had a stronger effect as its' consumption was followed by joy and by guilt in some women. Another study on chocolate consumption was done with healthy men and women and the findings showed that those with a higher probability of depression (proven by screening) were consuming more chocolate (Rose, 2010). Even though chocolate has been associated with joy and pleasure for a long time, only in 2006 it has been found to have stimulants, antidepressants, and relaxing properties. It does not only satisfy the craving but can also act as comfort food (Parker et al., 2006). According to Moreno-Domínguez et al. (2012) restrictions in the diet such as fasting increases food craving and therefore may lead to loss of control over overeating. Negative mood and fasting were observed to precede food craving and binge eating behaviours.

1.4. Foods connected to mood changes

Several studies look at the mood-food connection from the perspective of the influence a mood has on food preferences (Gardner et al., 2014). However, this research will study the mood and palatability of consumers after consumption of certain foods.

Some studies proved that the food people consume affects the chemical composition of the brain and influences mood. As foods consist of more than one nutrient, the interaction between them affects the production and release of neurotransmitters. Therefore, there is no doubt that there is a direct connection between brain function behaviours and nutrition. (Banjari et al., 2014).

A group of products have been looked at and researched in several studies previously. Those reports looked at the relationship between different foods and moods. In Macht & Dettmer (2006) chocolate consumption was followed by joy and guilt, in Dietz et al. (2017) green tea and cognitive performance were studied, and in Trivedi et al. (2015) the coffee was shown to raise alertness. Other tested foods also included milk because of opioid peptides that are pharmacologically like opium. Certain foods such as fish, fresh vegetables or fruits which create a balanced eating pattern for example in the Mediterranean diet, have been associated with a lower risk of depression meanwhile diets rich in sugar-sweetened drinks such as the western diet was observed to cause a higher risk of depression (Huang et al., 2019). The consumption of prebiotics (such as foods rich in chitosan oligosaccharides and fructooligosaccharides) was shown to improve psychological and biological states in people struggling with mood disorders. By adjusting the gut microbiota structure, prebiotics can have a positive effect on mental health, improve mood and may reduce the risks of developing psychological disorders (Tabrizi et al., 2019). Christensen (2001) mentions how often the literature demonstrates the relation between experiencing emotional conditions (e.g., depression) and inclination towards sweet carbohydrate and/or fat-rich foods. It proved that the preference for sweet foods rich in carbohydrates and fats in depressed individuals is a result of the mood that follows the consumption. On the other hand, the long-term mood enhancement strategy, which is a way to repair, lift or improve someone's mood instantly (Scott, 2020), could decrease or eliminate the added caffeine or sucrose in the diet (Christensen, 2001).

Hedderley et al. (1996) tested the composition of breakfast among 16 English participants to find the optimal composition for mood improvement. The meals varied between high carbohydrates and low fat, medium fat and medium carbohydrate, and high fat and low carbohydrate. The results showed that the number of macronutrients (carbohydrates, fat, and protein) in a meal (i.e., breakfast) can have a positive effect on mood while anomalies from everyday meal composition can cause a decline in one's mood state (Hedderley et al., 1996).

1.5. Palatability and Mood Scale

Palatability is a term that is not used consistently. It can refer to a property of food, the organism that eats the food or even both (Ramirez, 1990). However, for the purpose of this research, palatability will be defined as subjective pleasantness, the hedonic satisfaction or reward, and preference and acceptance for food at the point of consumption (Stubbs & Blundell, 2013, Donini et al., 2009). It is a post-ingestive and orosensory stimuli result of food consumption which is a subjective hypothetical construct such as hunger (Rogers & Blundell, 1991, Brouns & Dye, 2004). Palatability may influence food choice because of the relation to personal experiences while eating certain foods. Several sensory properties play a role in this process, those are the taste, smell, sounds, sight, and texture but particularly people's perception is affected by the shape of the food, colour, dimension, temperature, freshness, and edibility (Schiffman & Graham, 2000).

The Profile on Mood States (POMS) is a standard psychological test that is used in research to measure mood (Wood, 2017). It contains 65 mood questions that must be scored on a scale of 5 points. The scores for each question are recorded from 0 ("not at all") to 4 ("extremely"). The total sum is calculated using the Total Mood Disturbance scale. Some of the moods that can be tested by this validated test include sad, unhappy, lively, energetic, annoyed, discouraged, fatigued, furious, bitter, confident, anxious, nervous, satisfied, embarrassed and much more (Wood, 2017). Depending on the results, one can be assigned to one or more mood profiles such as Anger, Confusion, Depression, Fatigue, Tension and Vigor.

Another test used to assess the overall mood is The Mood Test which is an easy and quick option for evaluating the current mood. It consists of 20 questions with three possible answers each ("true", "false" and "the opposite"). This examination aims to learn whether the person's mood is euphoric (the person is overly excited) dysphoric (if a person is feeling blue) or euthymic–stable. It can be used to evaluate the overall mood of a person in presence and therefore it should help in the interpretation of other results.

1.6. Scope of the research

People consume a variety of products every day. Some research (Martin et al., 2012, Evers et al. 2013), showed that several foods have stronger effects on people's health, mood, or satisfaction and some are weaker. Most of those foods include fruits (Macht & Dettmer, 2006), chocolate (Martin et al., 2012) or coffee (Trivedi et al., 2015) but no data are available on the difference in contentment and satisfaction between animal-based and plant-based products. It is not known whether there is a distinctness between the palatability resulting from animal-based product consumption and its vegan alternative.

This research will look at animal-based versus plant-based foods and their association with positive and negative moods. The main question of this research, therefore, is going to be: "How do plant-based alternative foods versus traditional animal-based foods affect the mood and palatability of a consumer?". The power of perception of foods will be tested in this research. The satisfaction and contentment resulting from the consumption of a non-meat product that resembles meat will be tested. The research will also examine whether the plant-based alternatives and their animal-based equivalents have a direct short-term impact on one's mood and palatability after consumption.

The sub-questions of this research will be:

1. How are the consumers' palatability and mood affected by eating animal-based product?
2. How are consumers' palatability and mood affected by eating a plant-based product?
3. To what extent do people prefer plant-based products over their' animal-based equivalents?

The answers to the main and sub-questions will be obtained through quantitative and qualitative research including product tasting. The results of this research could be of potential use for consumers to understand better how perceptions about food affect their choices, but also for food companies to understand what drives consumers to their products and how the plant-based product is important for customers as the shift towards the plant-based diet has been shown to drive companies to adapt to the new needs of their audience (Chan, n.d.).

Food strongly affects humans' moods and has an impact on human's overall health and wellbeing. Therefore, the hypothesis of this research will be that due to the perception of the supremacy of plant-based foods over animal-based, a better mood after eating the vegan product will be observed among the consumers. With the rapidly rising recognition of plant-based alternatives on the market (Chan, n.d.), people's eagerness to try vegan products (Dunn, 2012), and growing sales in this sector (Pritchett, 2021) it is of big importance for food companies to learn about the consumers drive to purchase certain products in the market. Thus, the overall objective of this study was to assess the satisfaction and contentment level after consumption of animal-based products and their plant-based alternative and learn if there is a difference between them.

Chapter 2: *Proposed materials and methods*

2.1. Materials

For this report, quantitative and qualitative researches were conducted. The survey with questions assessing the mood and results from product tasting, together with accompanying experiences were prepared and given to participants in paper and online form. The people taking part in this activity were young adults aged 18-25. They were divided into randomized groups based on the order of samples received. Twenty people took part in the study. It is considered enough as in other studies that focused on food and mood connections such as Dietz et al. (2017) and Moreno-Domínguez et al. (2012) also considered around twenty people as a representative group. The product tested was a polish dried, thin sausage – kabanos. For this research, the original version, as well as the plant-based version, were used. They were both from the same brand. They did not differ strongly in colour, smell, and consistency, therefore, were a suitable product to test in this research. The samples were given on two different days but were served in identical dishes. Participants were aware when they consume plant-based and animal-based product.

Figure 1. Original animal-based (meat) sausage (left) and the alternative plant-based (vegan) sausage (right). (*Original Tarczyński Thin Sausages*, n.d., *Vegan Tarczyński Thin Sausages*, n.d.)

2.3. Methods

The tests and questionnaires were handed out to participants in person before and after the product tastings. All the questions were clear, understandable, and easy to complete and answer. The questionnaires were in English and consisted of closed and open questions but for in-depth experiences explanations and understating of certain behaviours, beliefs and choices notes were taken. Participants answered the questions from the survey in appendix 1 which tested their age, gender, diet, product preference. The part of the main survey was also a questionnaire from appendix 2 which measured the change in certain mood states before and after consumption of the animal-based product and the plant-based product. The first and second sub-questions through product tasting tested the short-term effects of a particular food product on consumer satisfaction, satiety, and pleasantness. The tastings were conducted on two different days, with the same group of people. All the participants were instructed not to interact with each other during the trials. One day the animal-based product was tested and on the other day the plant-based alternative product. The reason for that is for participants not to compare the products against each other. Tastings were done in a room rented specifically for this purpose. The sub-question number 3 measured the liking of the plant-based alternative product to learn about the preference and acceptance of it versus its animal-based equivalent. The preference was tested on the mood scale.

The Mood Test checked what is the general attitude of a tested person. The euthymia, dysphoria and euphoria levels were checked as a part of the general overall mood of participants. To understand the results, one must know that the state of being relatively neutral and stable is called euthymia and is also used in a mental health context (BD Editors, 2017). It is referred to as the state of well-being and tranquillity (American Psychological Association, n.d.). The term euthymia, next to dysphoria and euphoria is used to picture better the outcomes of the research. A high score in euthymia level means a person is very stable. A high score in dysphoria levels may mean that a person is feeling down or depressed and a high level in euphoria levels may mean a person is overly excited. Those levels were measured to have a general overview of participants' mood status.

Later the survey inspired by the POMS Scale Test identified the mood of a participant at a certain moment. Then the product was tasted and evaluated. Finally, the survey from appendix 2 POMS-inspired test was repeated to learn about the possible changes in the mood. The Profile on Mood States test is considered appropriate as was also used in an intervention study on the effect of matcha tea, in drink and snack bar formats, on mood and cognitive performance (Dietz et al., 2017) where it revealed no significant changes in mood. After that, some additional questions were asked to better understand the choice process and participant preference for a product as well as how the consumed product affected one's mood and palatability.

To test whether the differences are significant the Wilcoxon Signed Rank Test was performed. The statistical analysis was used to compare the differences in changes in moods between two situations, one being plant-based product tasting, and the other the animal-based product tasting. Wilcoxon Signed Rank Test is a statistical hypothesis test used to compare related samples that can be performed on ranked data. It allows for testing the differences between dependent groups. The results of this statistical analysis proved whether the difference in mood changes is significant or not.

The changes in the level of mood for the two tastings were compared. For all the moods and each product tasting ranks were assigned accordingly. 1 for the decrease in mood level, 2 for

no difference and 3 for the increase in a mood state. For each mood, the data was collected into two samples. Sample 1 was plant-based results and sample 2 was animal-based results.

The W test statistic was calculated using the formula below. If the W value is lower than mentioned in the table (appendix 6, table 19) under the alpha value of 0.05, then it can be concluded that the result is statistically significant. For 20 values in each sample, the non-tied pairs were identified. Then it was checked in the alpha values table whether the difference is significant.

2.4. Data Analysis

The design checked the differences in a dependent variable – mood, satisfaction, and contentment as well as happiness, energy, alertness, stress, annoyance, nervousness, tension, and clear-headedness related to an independent variable which is animal-based and plant-based food products. The first survey gave a general overview of age, gender, diet, and mood state (euphoric/dysphoric/euthymic according to The Mood Test from psycholocia.co/mood-test), as well as looked at the preference of the product. It was done to be able to observe eventual connections between people's mood stability and their mood changes during product tastings. The second survey focused on the different moods such as satisfaction, happiness, energy, alertness, stress, annoyance, nervousness, tension, clear-headedness, and contentment. The data gained by tests and questionnaires were analyzed through the statistical tests in tables and graphs as well as text analysis. Those methods aimed to solve this complex matter.

Table. 1. Variables and statistical test

Type	Variable	Statistical test
Dependents	Moods: Satisfaction, Happiness, Energy, Alertness, Stress, Annoyance, Nervousness, Tension, Clear headiness, Contentment	Wilcoxon Signed-Rank Test
Independent	Animal-based product	
	Plant-based product	

Chapter 3: Results

This chapter's goal is to present the results obtained through research and data collection. First, the general data is displayed such as the number of people that take part in the research, the group's gender, and age representation as well as eating habits. Later, information is elaborated on per sub-question.

3.1. General data

20 Dutch persons were part of this research. The study was done in Austria and all participants were ski instructors. The ages varied from 18 to 25 with the majority between 18 and 21 years old (figure 2). The group consisted of 7 females and 13 males. 15 of them claimed to be omnivores and 5 identified as flexitarians. 6 of all of them classified themselves as emotional eaters (appendix 4, tables 7-14).

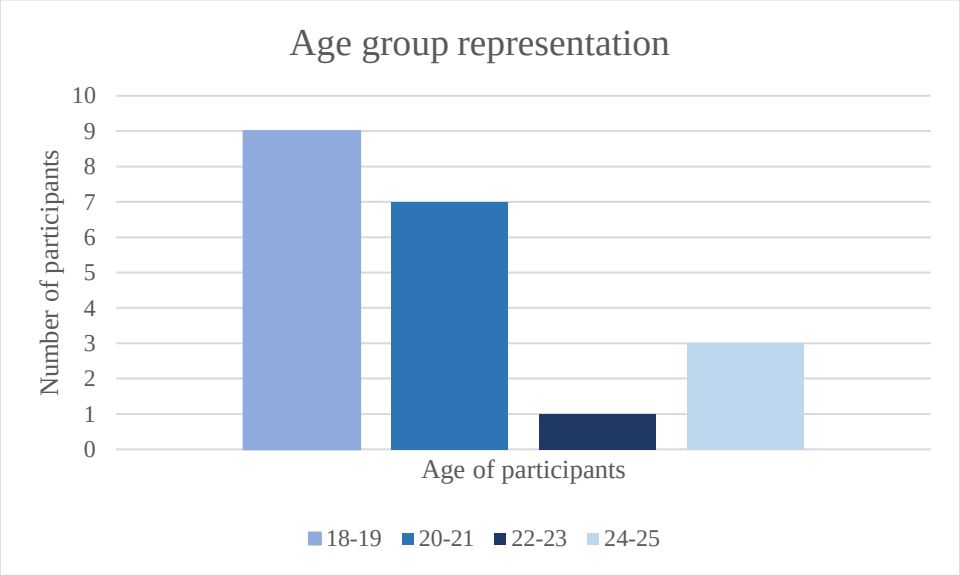

Figure 2. Age group representation

The overall mood of respondents was measured at the beginning of the study through the Mood Test (from psychologia.co).

For most of the participants, the major state was euthymic, neutral (15) and for some euphoric, ecstatic (2). The majority did not present highly depressive states (17), and only two people who had dysphoria scored higher than their level of euphoria. The average score for each option was as follows; euthymia averaged 58.75, dysphoria averaged 11.50 and euphoria 29.75 (figure 3).

The respondents' scores are shown in appendix 5, table 15 and figure 28, and the average for each mood state is presented in figure 3 below. The deviation bars are to help visualize the differences between peoples' mood states.

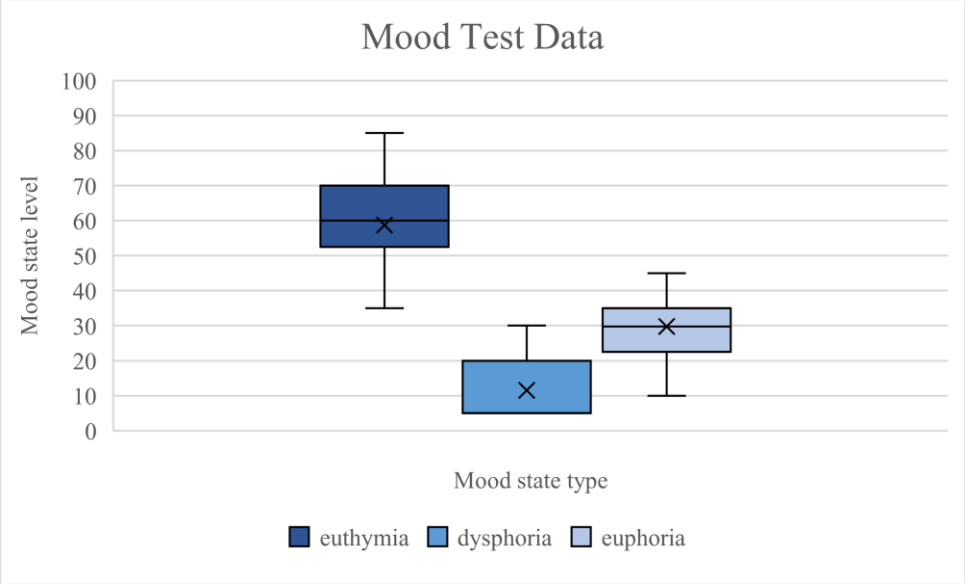

Figure 3. Mood Test Data with deviation.

3.2. The effect of animal-based products on consumers' palatability on mood

The first sub-question was "How are the consumers' palatability and mood affected by eating animal-based products?". The answer to this question was gathered through the POMS-like analysis. The mood of people before and after consumption of animal-based was examined.

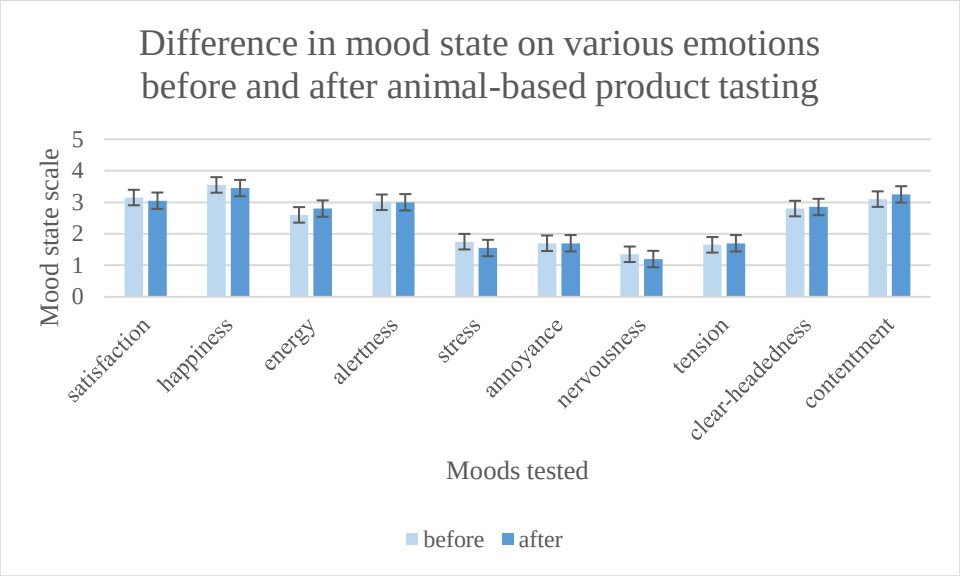

Figure 4. Average scoring before and after tasting (animal-based product).

Ten moods were tested and for each question 'Are you feeling (certain mood)?' participants could choose on a scale from 1 to 5: 1 being 'not at all', 2 'a little', 3 'moderately', 4 'quite a bit' and 5 'extremely'. The average mood levels (appendix 5, table 17) before tasting were highest in happiness (3.55), satisfaction (3.15), contentment (3.1) and alertness (3.0), and the lowest for nervousness (1.35), tension (1.65), annoyance (1.7), and stress (1.75). The averages in mood levels after tasting were highest in happiness (3.45), contentment (3.25), and satisfaction (3.05), and lowest for nervousness (1.2), stress (1.55), and tension and annoyance (both 1.7).

The biggest changes (appendix 5, table 17) in mood were observed in the level of energy (average change of 0.2) and stress level (average change of 0.2). An increase in average overall levels of energy (0.2), happiness (0.1), tension (0.05) and contentment were observed. No critical changes in annoyance and alertness levels were shown. Decrease of level of satisfaction (0.1), stress (0.2), nervousness (0.15) and clear-headedness (0.05) were recognized. The mood changes varied among participants, however, to present the results, the average scores were calculated and examined.

The Wilcoxon Signed-Rank statistical test was performed to analyse the significance of the change in the mood before and after consumption of each product. The test compares the scores and ties pairs of the same numbers, which reduces the sample size (N). The whole sample for each mood was 20 people, however, many scores were identical in the before and after columns. This is why the N is smaller than 20 for all the moods. The results do not show any significance in the results at a p lower than 0.05.

Table 2. Wilcoxon Signed-Rank test for mood change after animal-based product.

mood	z-value (for N ≥20)	w-value (for N<20)	p-value	critical value for W	significance at p< 0.05
satisfaction	-0.5923	17.5	n/a	5 (at N=9)	no
happiness	0.78716	30	0.78716	10 (at N=11)	no
energy	-1.4676	3.5	n/a	0 (at N=6)	no
alertness	-0.1048	10	n/a	0 (at N=6)	no
stress	-0.9297	8.5	n/a	2 (at N=7)	no
annoyance	-0.07	17.5	n/a	3 (at N=8)	no
tension	-0.2548	25	0.80258	8 (at N=10)	no
nervousness	n/a	n/a	n/a	n/a	n/a
clear-headedness	-0.2223	30.5	0.82588	10 (at N=11)	no
contentment	-0.7108	16.5	n/a	5 (at N=9)	no

Figure 5 shows how many persons' mood states increased, decreased, or remained the same.

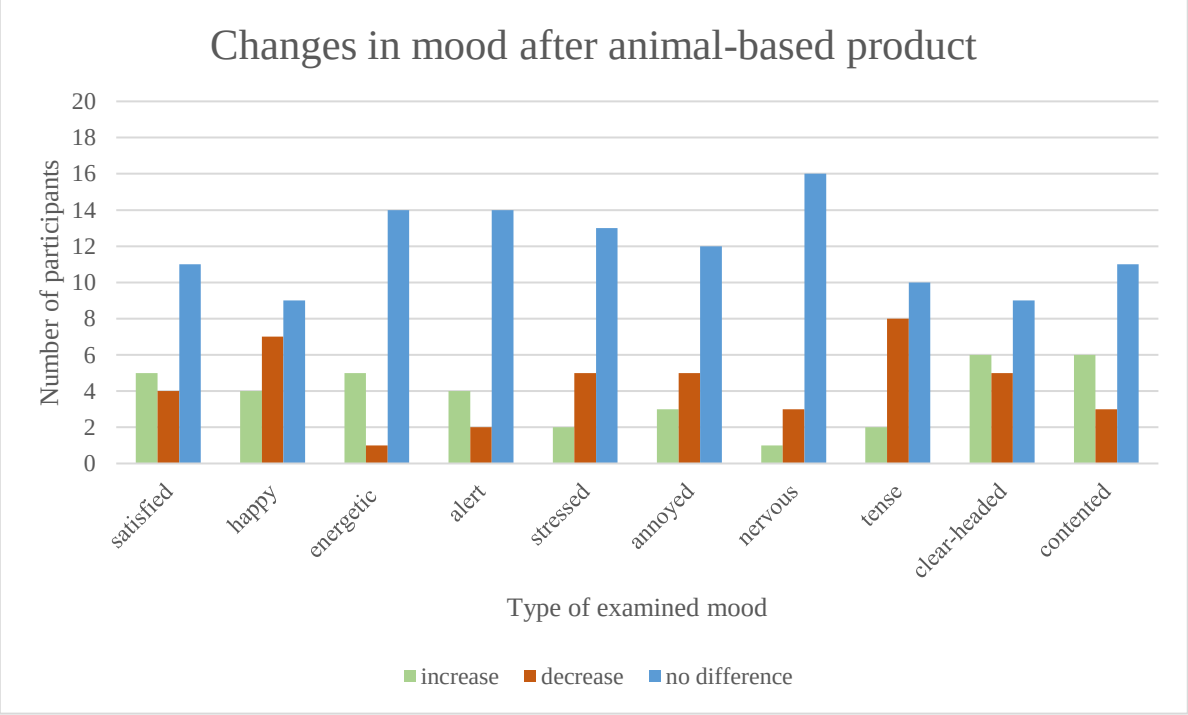

Figure 5. Changes in mood after animal-based product.

The analysis of answers shows whether there was an increase in mood state, a decrease or the mood did not change (no difference). Figure 5 is used to better visualize the data from table 15 (appendix 5). For each mood type, the biggest group representation did not show a difference in the mood before and after consumption of an animal-based product, however, for the level of tension and happiness, a high number of people observed a decrease after consuming the product.

3.3. The effect of plant-based products on consumers' palatability on mood

The second question of this research was "How are consumers' palatability and mood affected by eating a plant-based product?". To measure the consumers' palatability, the author asked participants for their opinion on that matter as well as got evidence from mood tests.

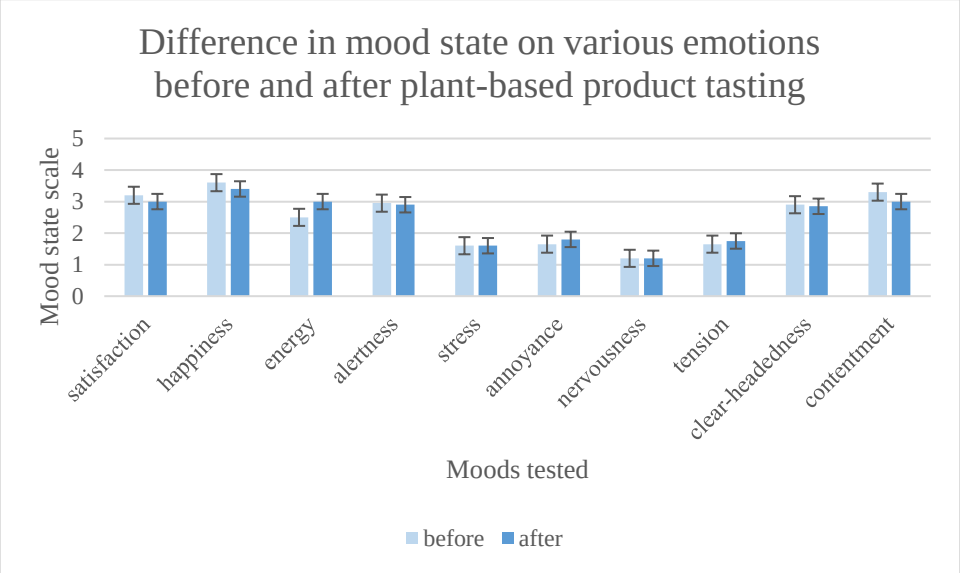

Figure 6. Average scoring before and after tasting (plant-based product).

The average mood levels before a tasting of a plant-based product, which took part on a different day than the tasting of an animal-based product were as follows. The highest average scores before the tasting were observed for happiness (3.6), satisfaction (3.2) and contentment (3.3) and the lowest for nervousness (1.2) and stress (1.6). The averages after the consumption of plant-based product were highest in happiness (3.4), satisfaction, energy, and contentment (all at 3.0), and lowest for nervousness (1.2) and stress (1.6).

The biggest changes in mood were detected in levels of energy (+0.5) and contentment (-0.3). An increase in average mood levels was recognized in energy levels (average increase of 0.5), annoyance (+0.15) and tension (+0.1). Average levels of stress and nervousness were not affected. A decrease in mood state was observed for the level of satisfaction (-0.2), happiness (-0.2), alertness (-0.05), clear-headedness (-0.05) and contentment (-0.3). Individual changes are reported in table 18 (appendix 5), meanwhile, the average scores are demonstrated in figure 6.

The same statistical test was done for plant-based product mood change analysis. In this case, the results also did not show any significant difference in moods before and mood after consumption.

Table. 3 Wilcoxon Signed-Rank test for mood change after plant-based product.

mood	z-value (for N ≥20)	w-value (for N<20)	p-value	critical value for W	significance at p< 0.05
satisfaction	-1.007	14	n/a	5 (at N=9)	no
happiness	-0.9102	11.5	n/a	3 (at N=8)	no
energy	-1.8362	7	n/a	5 (at N=9)	no
alertness	-0.3145	9	n/a	0 (at N=6)	no
stress	-0.1348	7	n/a	n/a	no
annoyance	-0.809	4.5	n/a	n/a	no
tension	-0.629	7.5	n/a	0 (at N=6)	no
nervousness	-0.4045	6	n/a	n/a	no
clear-headedness	-0.2801	16	n/a	3 (at N=8)	no
contentment	-1.2159	23.5	0.22246	13 (at N=12)	no

How mood states changed after consumption of plant-based product are shown in figure 7 and appendix 5, table 16 which indicate how many persons' mood states increased, decreased, or remained the same.

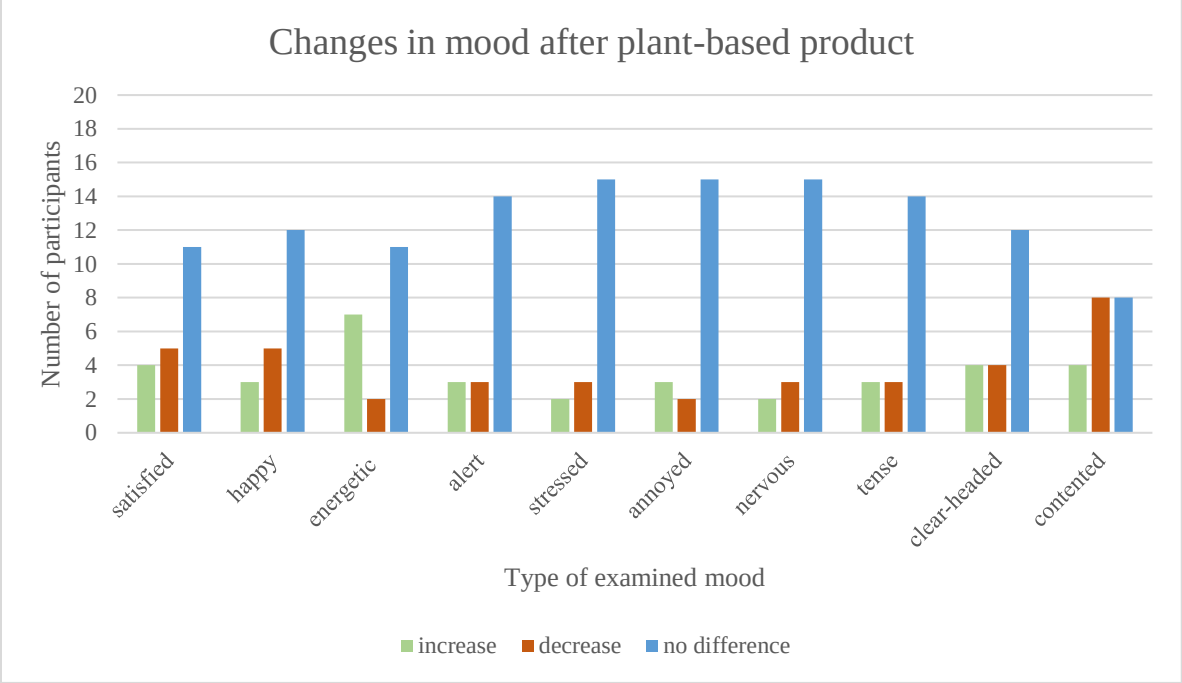

Figure 7. Changes in mood after plant-based product.

Similarly, to the animal-based product tasting, the majority of people did not annotate any changes. However, the level of energy did improve in seven people and contentment did decrease in 8 people's opinions after consuming the product.

3.4. Respondents' product preferences and opinions

Finally, the third and last sub-question of this research was "To what extent do people prefer plant-based products over their' animal-based equivalent?". To answer it, the participants were asked directly about their preference for products. The raw data is displayed in tables in appendix 4.

Table. 4. Analysis of participants' opinions on plant-based alternatives.

opinions analysis	
1	good for ethical vegetarians
2	prefers meat
3	believes plant-based is healthier
4	there difference in tastes is perceptible
5	there difference in tastes is perceptible
6	does not consider it as a meat replacement
7	likes the choice
8	enjoys eating alternatives
9	no opinion
10	perceptible differences but good for the environment
11	enjoys eating alternatives
12	good for environment
13	enjoys eating alternatives
14	likes the choice
15	likes the choice
16	good for vegetarians
17	no opinion
18	likes the choice but perceptible differences
19	no opinion
20	prefers vegan

After conducting tests, the data presented itself in the following way. The majority (14 people) decided they preferred animal-based product (table 12), and 6 people chose the plant-based alternative. Of the whole group, the majority (11) when asked about their opinion, claimed they did not observe any difference in their mood change whether they ate animal- or plant-based product (table 13). Two people thought their mood is better after the plant-based alternative, but after analysing their individual responses, it was not shown in the results of the POMS-like test. In seven respondents' opinions, their mood was better after consuming the animal-based (meat) equivalent (table 13), but after individual responses analysis, these results were not clearly visible in the mood tests.

Participants were asked to share their opinion on plant-based alternatives and their impressions were analyzed in table 4. Participants were asked an open question to share their opinion on plant-based alternatives in general. Some of them agreed that this kind of products is a good opportunity for people who cannot or do not want to eat meat but still enjoy its' taste or those who do not want to hurt animals. It was a popular opinion among eight participants that there is a big variety in those products on the market and many are good alternatives. Four people claimed to consume plant-based alternatives and two shared their concern for the environment for which they believed vegan products were less harmful. It was also mentioned that plant-based food is lighter and therefore better for one's health. In contradiction, six participants preferred meat and commented that plant-based substitutes do not taste the same and have a different mouthfeel. The taste was believed to be worse than of original equivalents and even though there is an eagerness to decrease the consumption of meat, the current market offer is not satisfying in their opinion. Three of the people did not have an opinion. Thirteen of the people had a positive attitude towards plant-based offers.

The Wilcoxon Signed-Rank test was performed separately for assessment of plant- and animal-based product effects on mood change. An independent analysis was also done using the same statistical test to compare the degrees of change in moods between plant- and animal-based product tasting. For this test, the data analyzed considered only the increase, decrease or no difference in mood and did not look specifically at the magnitude of the change. Number 1 was used for decrease, 2 for no difference and 3 for increase. The test similarly rejected the identical number pairs and based the significance on the non-tied pairs sample (N). Again, none of the results appeared to show a significant difference between the outcomes.

Table 5. Wilcoxon Signed-Rank Test data – the significance of differences in moods between products tested.

mood	n (non-tied pairs)	W test statistic	critical value for W	significance $p<0.05$
satisfaction	7	10.5	<2 (at N=7)	no
happiness	10	25	<8 (at N=10)	no
energy	7	13	<2 (at N=7)	no
alertness	5	5	n/a	no
stress	6	7	<0 (at N=6)	no
annoyance	10	21	<8 (at N=10)	no
nervousness	5	6	n/a	no
tension	8	18	<3 (at N=8)	no
clear-headedness	12	36	<13 (at N=12)	no
contentment	8	4	<3 (at N=8)	no

3.5. Comparison of mood change levels

The data mentioned above were the results of an open question to the participants. However, having gathered very useful information on changes in mood that happened after consumption of each product tested, the outcomes can be compared to help understand the differences in satisfaction on a more unconscious level. Of the ten moods tested six of them can be classified as positive (satisfaction, happiness, energy, alertness, clear-headedness, contentment) and four of them as negative (stress, annoyance, nervousness, tension). Therefore, an increase or decrease in each of them should not be misunderstood as improvement and diminishment in all of the moods.

In the figures below the change in the mood before and after both product tastings are shown and can be compared. As shown in the figures, not all moods were affected by the consumption of the eaten product. Average satisfaction after plant-based products decreased but improved after animal-based ones. No change in the level of happiness was observed during the animal-based tasting, but it slightly decreased after consumption of a plant-based substitute. There was an increase in levels of energy after vegan product consumption and a visible but smaller change in energy during meat product tasting. A decrease in clear-headedness levels was observed after respondents consumed meat product. This change was not observed after the plant-based one. No differences were also observed in levels of alertness. The average level of contentment decreased after plant-based product consumption but increased after animal-based product. The average stress level before and after consumption of plant-based product did not change, while during animal-based product the difference is clearer and the average level of stress decreased. Annoyance did increase in a bigger number of people after consumption of the animal-based product; however, the increase was also seen in substitute product tasting. The level of nervousness did decrease in both situations, but at a more visible level after the animal-based product. No differences were observed in levels of tension.

The hypothesis of this research was that due to the perception of the supremacy of plant-based foods over animal-based, a better mood after eating the vegan product would be observed among the consumers. Therefore, the Wilcoxon Signed Rank Test was performed. For none of the moods has the test identified a significant difference.

1. Level of satisfaction

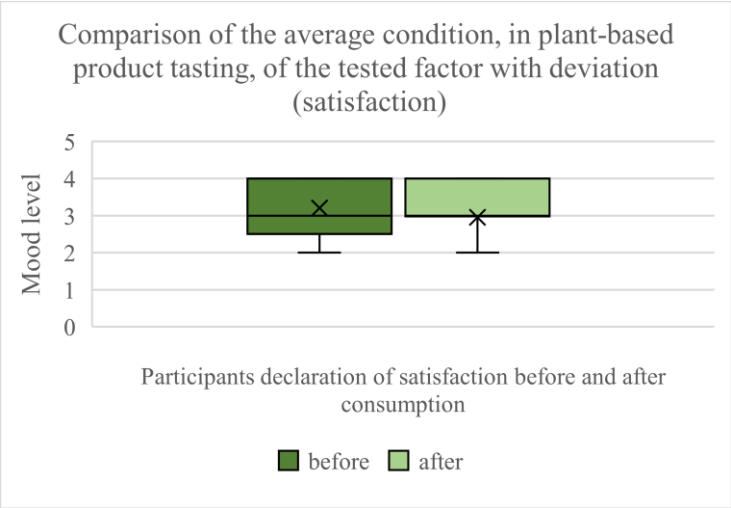

Figure 8. Change in satisfaction level after plant-based product consumption.

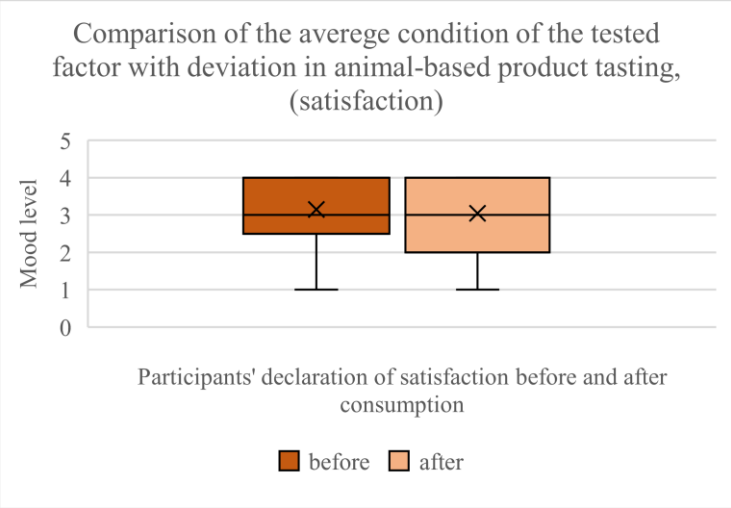

Figure 9. Change in satisfaction level after animal-based product consumption.

2. Level of happiness

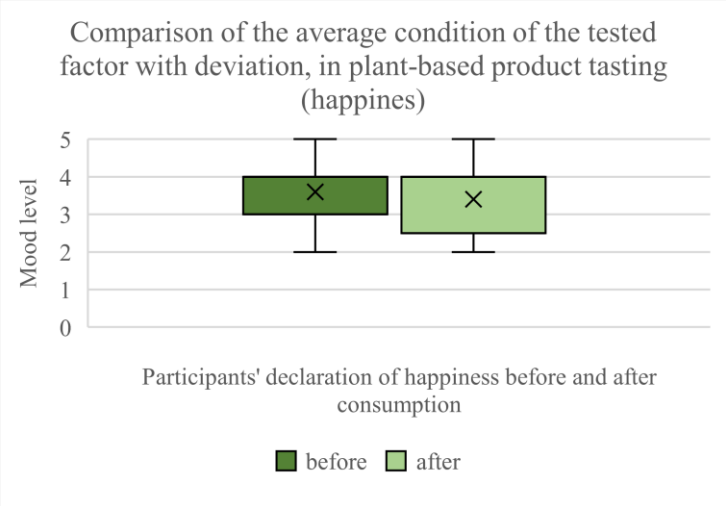

Figure 10. Change in happiness level after plant-based product consumption.

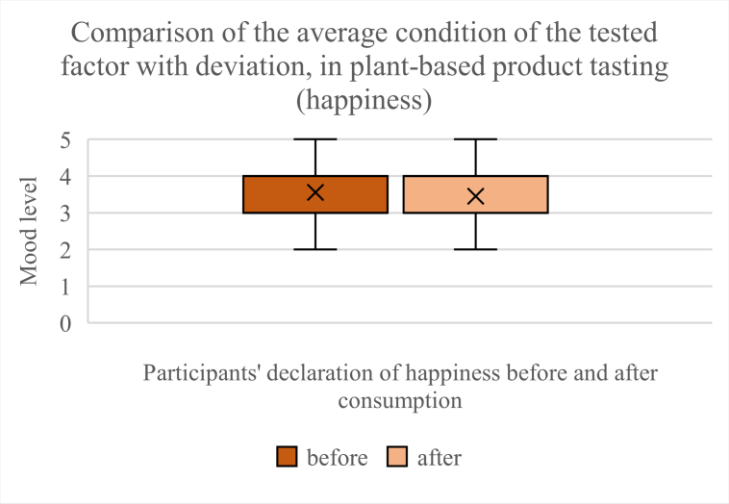

Figure 11. Change in happiness level after animal-based product consumption.

3. Level of energy

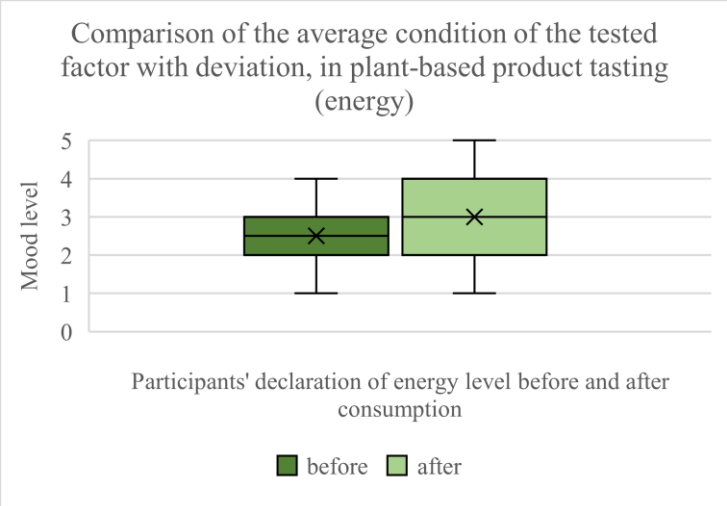

Figure 12. Change in energy level after plant-based product consumption.

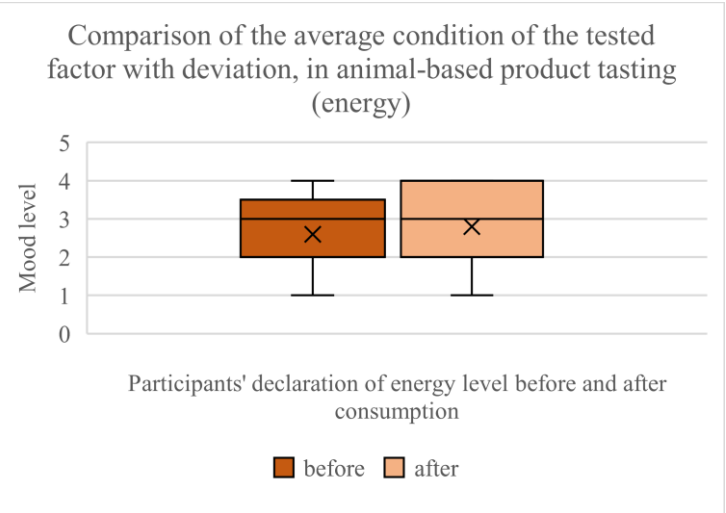

Figure 13. Change in energy level after animal-based product consumption.

4. Level of stress

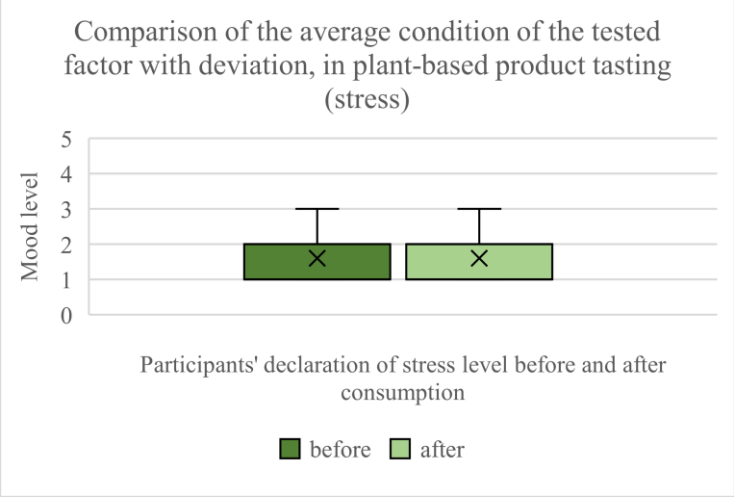

Figure 14. Change in stress level after plant-based product consumption

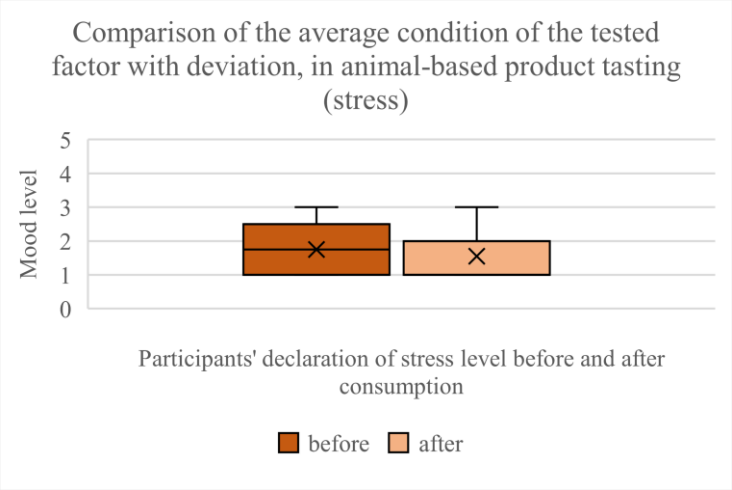

Figure 15. Change in stress level after animal-based product consumption.

5. Level of annoyance

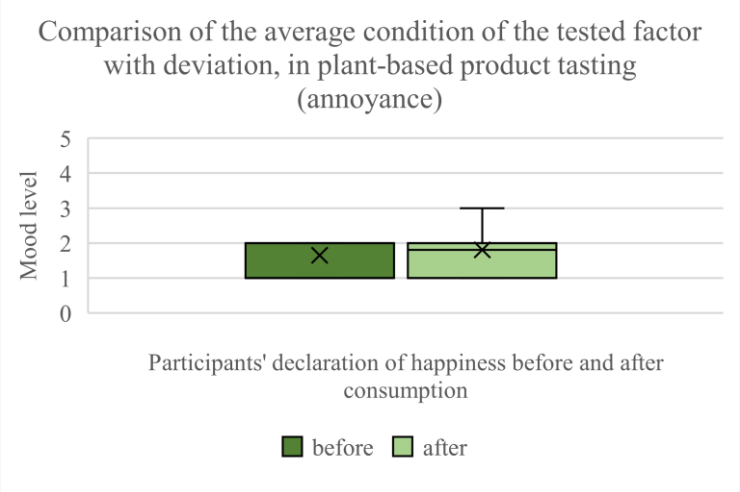

Figure 16. Change in annoyance level after plant-based product consumption.

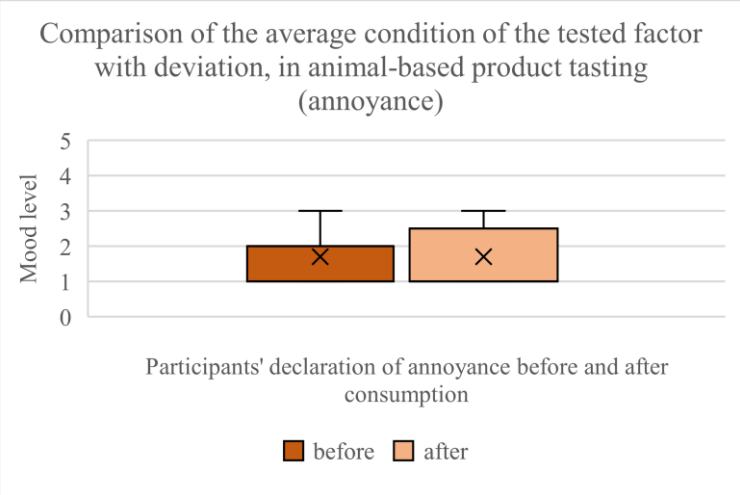

Figure 17. Change in annoyance level after animal-based product consumption.

6. Level of nervousness

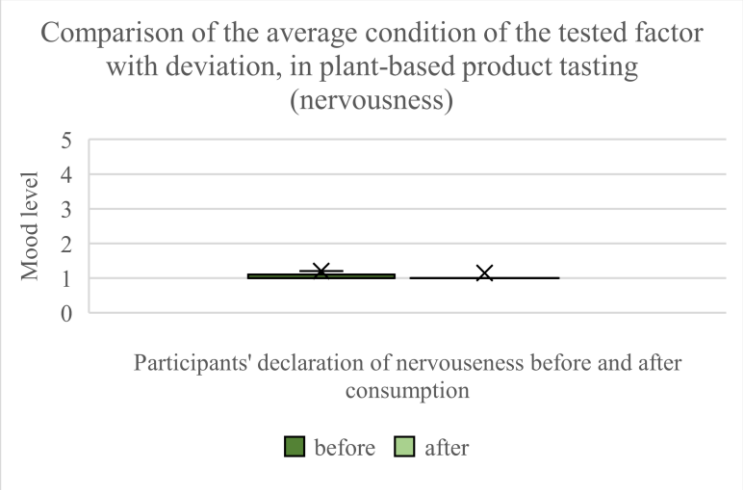

Figure 18. Change in nervousness level after plant-based product consumption.

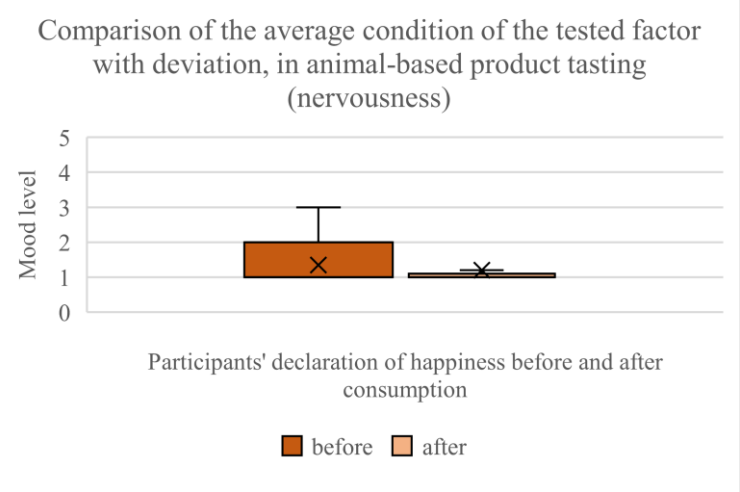

Figure 19. Change in nervousness level after animal-based product consumption.

7. Level of tension

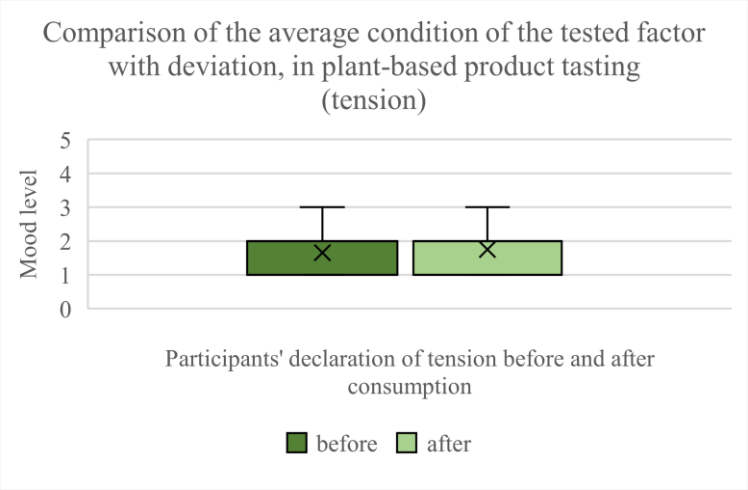

Figure 20. Change in tensions level after plant-based product consumption.

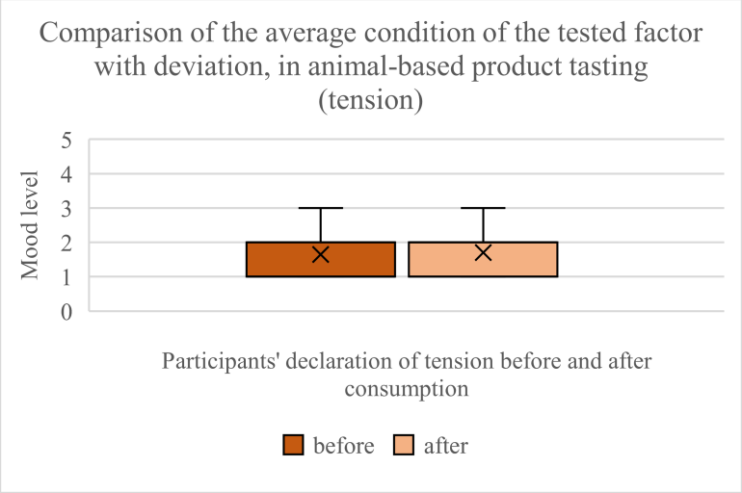

Figure 21. Change in tension level after animal-based product consumption.

8. Level of clear-headedness

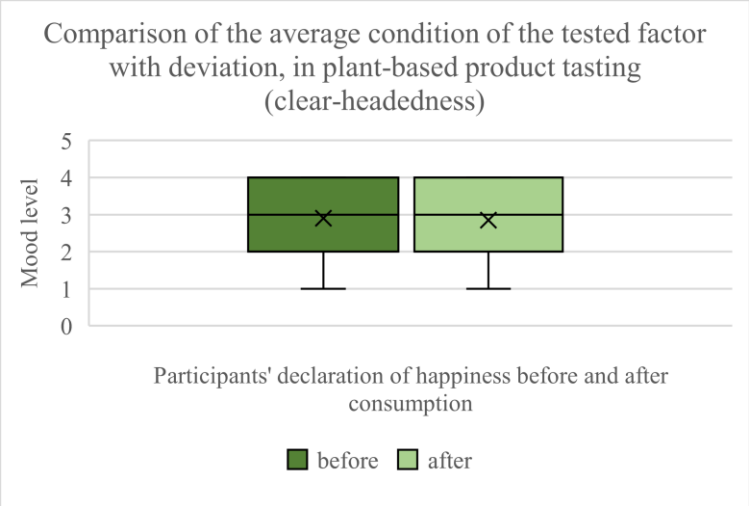

Figure 22. Change in clear-headedness after plant-based product consumption.

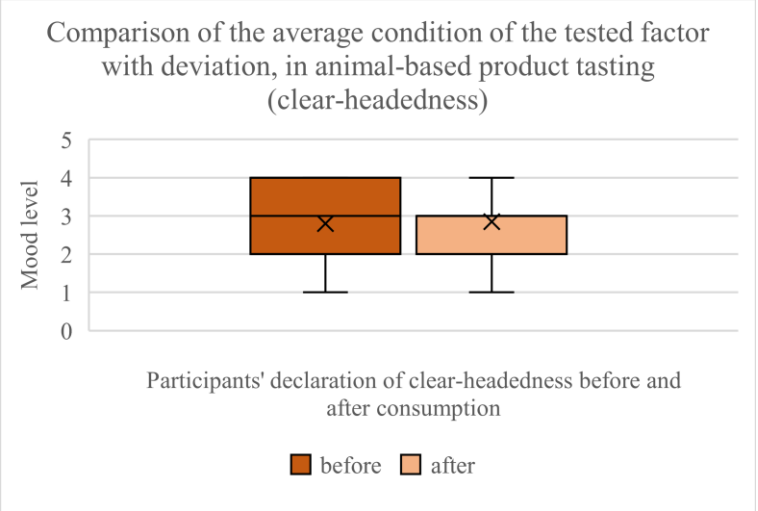

Figure 23. Change in clear-headedness level after animal-based product consumption.

9. Level of alertness

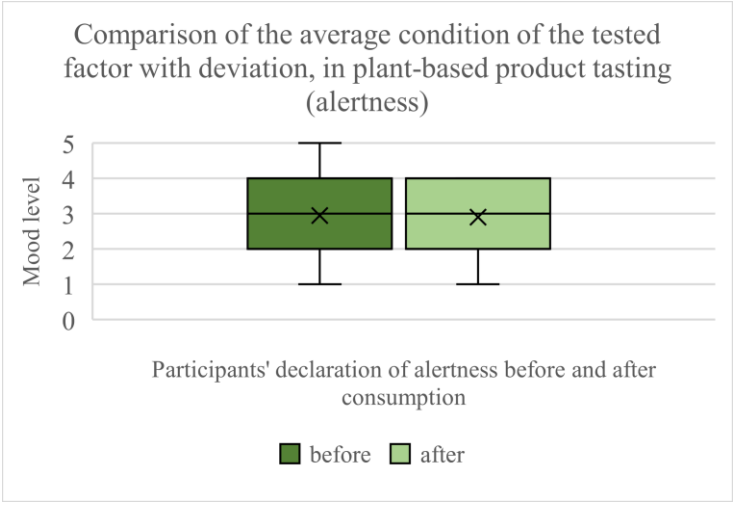

Figure 24. Change in alertness level after plant-based product consumption.

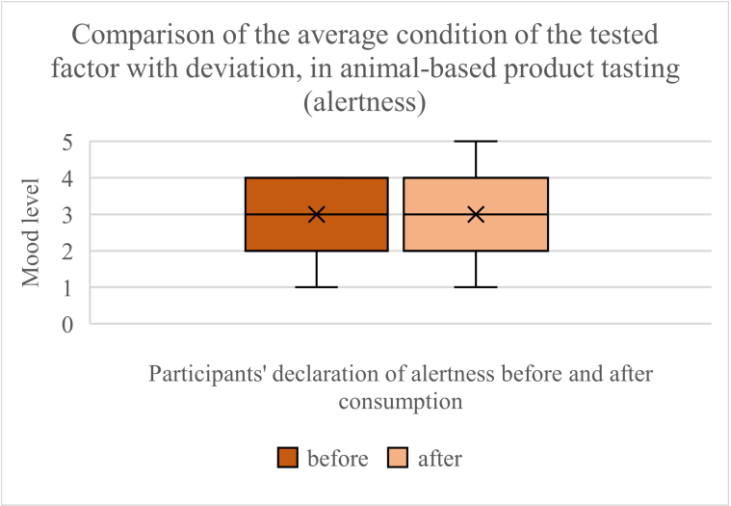

Figure 25. Change in alertness level after animal-based product consumption.

10. Level of contentment

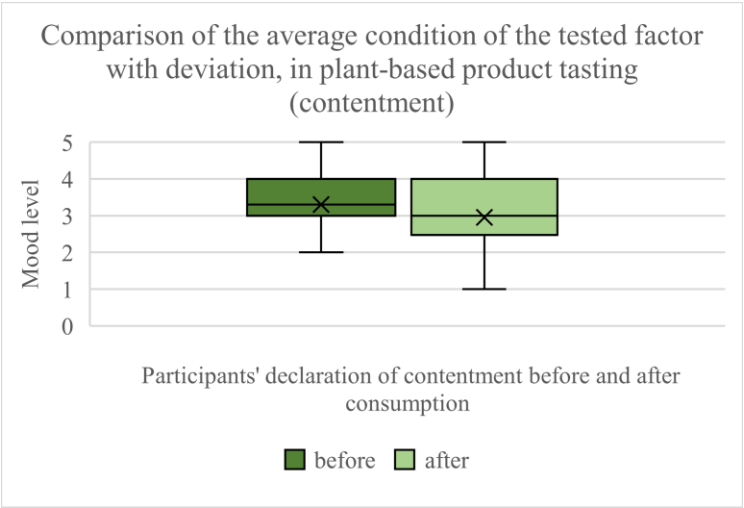

Figure 26. Change in contentment level after plant-based product consumption.

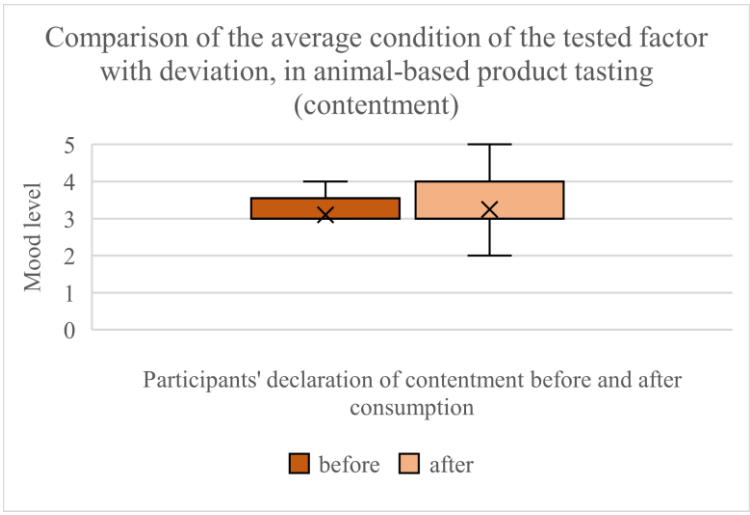

Figure 27. Change in contentment level after animal-based product consumption.

Chapter 4: Discussion of results

In this chapter, the chosen methodology and the results of the research are discussed. The objective of this thesis was to assess the satisfaction and contentment level after consumption of animal-based products and their plant-based alternative and learn if there is a difference between them.

Some studies suggest that the consumption of specific products is responsible for certain mood states. Macht & Dettmer (2006) proved that chocolate consumption was followed by joy and guilt, Dietz et al. (2017) showed that green tea has an impact on cognitive performance, and Trivedi et al. (2015) displayed that coffee raises alertness. On top of that, some foods play a role in lowering depression risks and some in lifting it (Huang et al., 2019).

4.1. Reflection on methodology

The probation process consisted of the gathering group of 20 people, testing their overall mood status, and carrying out two tastings, one with the animal-based product and the other with the plant-based product. All the participants were instructed on the process of the study and it was clear to them what is expected. The questions were straightforward and no one had problems understanding and answering them. The method used was efficient and could be used for other similar studies.
The group size was compared to the sample size in Dietz et al. (2017) and Moreno-Domínguez et al. (2012), who used respectively 23 and two groups of 20 and 21. Even though the group size was similar to these studies, for this research it was considered not big enough. There were certain differences observed, but none of them was significant. By increasing the group size, the sample would be built of more diverse people, which would possibly give a better overview and more balanced results.
The participants of this research were all Dutch people aged 18-25. They were all ski instructors and so shared similarities. It is believed that such relatable types of people also tend to have a similar mindset. A more diversified group, bigger, more international or varied in ages would have been more reliable. The majority of tested people were male; however, it could be that group in which halves are men and women would be more representative. The current mood before and after both tastings were tested and the data was later analyzed. When it comes to eating style, all participants were omnivores and/or flexitarians which was reasonable as the tested products were animal-based so would not be suitable for vegetarians and vegans. Due to time and budget constraints the number and type of people, with similar mindsets and backgrounds, were not ideal representation. A larger group was, however, not feasible due to the high level of sophistication of the test.
The data for the first and second sub-questions were collected in the same way. Two tastings were organized on two different days and questionnaires were analyzed at the end of the research. The process would have gone smoother if the surveys were online and each of the participants could fill it in on a laptop or tablet. Unfortunately, it was not the case as the researcher conducting the experiment did not have so many tools. Having 20 people answer questions in each tasting on paper caused a lot of rewriting, however, most of the processes went according to the plan.

4.2. Effect of animal-based product on consumers' palatability on mood

The first sub-question of this research, 'how are the consumers' palatability and mood affected by eating animal-based products?' was answered by analyzing the data collected in questionnaires. The statistical analysis performed through the Wilcoxon Signed Rank Test did not show any significant differences, but a detailed analysis of the results did show slight changes. Alertness and tension were not affected by the consumed product. The consumers' satisfaction, energy, and contentment improved after the animal-based product, and stress and nervousness levels decreased. Nevertheless, the level of annoyance visibly increased, and the clear-headedness lessened. According to Appleton & Rogers (2004), the effects on moods such as happiness, anxiety and more are attributed to nutritional and pharmacological food components as well as personal consumers' characteristics. This could mean that mood differences do not only relate to the plant- or animal-based ingredients of the product but also other used substances such as starch, spices, soy protein, and stabilizers. Also, sensory properties play a role in palatability. Taste, smell, sounds, sight, texture, shape, colour, dimension, temperature, freshness and edibility have an impact on human senses (Schiffman & Graham, 2000).

4.3. Effect of plant-based product on consumers' palatability on mood

In the second sub-question 'how are consumers' palatability and mood affected by eating a plant-based product?' the results, also did not show any significant changes in the mood states before and after consumption but certain differences were still observed. Tension and alertness were not affected by the plant-based product consumption. By eating a plant-based product, the consumers' satisfaction, happiness, and contentment shrank, nervousness decreased, and annoyance grew, but energy levels clearly improved. This could be a result of the positive impact the plant-based diet has on gut health (Dunn, 2012). As meat is a natural source of essential nutrients such as iron, zinc, selenium and B12 vitamin (ThinkBeef.ca, 2021), it could be that their impact was faster and more evident in this examination. Despite little evidence of short-term improvements in mood related to plant-based product consumption, reduced meat intake has many health benefits. Decreased risk of cardiovascular disease or lower cholesterol level, prevention of depression and anxiety (Dobersek et al., 2020) are just a couple of examples, however, those effects are rather long-term influences of diet change.

4.4. Differences in mood changes levels

The results of this research aimed to help answer the main questions of this thesis, "How do plant-based alternative foods versus traditional animal-based foods affect the mood and palatability of a consumer?". The outcomes for some moods are clearer than for others and therefore should be looked at separately. As some of the moods represented positive emotions, and others negative or neutral, it must be considered when analyzing the increases and decreases of different mental states.

The moods that showed change and could be differentiated between animal-based and plant-based product, can be used to compare the outcomes of the research and answer the sub-questions. Not all the moods were affected by a strong increase or decrease, which does not

necessarily mean the product did not influence the mood. The stability of mood before and after consumption stills says a lot. If a positive mood did not decrease, it could be a good sign, similarly when the negative mood did not increase.

Moods for which high change amplitudes were not observed include no change in happiness level before and after animal-based product consumption, no change in stress levels before and after plant-based product consumption, and no differences were observed in levels of tension in both product tastings. It could be that those moods were not affected by the consumption of the given product, or that no change is also a visible effect of influencing the mood. No changes were visible in the level of alertness for both products, and the level of clear-headedness stayed stable after the plant-based product.

Considering tested moods were both positive and negative, the increase and decrease can both mean a good and a bad thing. The average satisfaction (which is a positive mood) decreased after the plant-based product tasting but increased after the animal-based product tasting. The average level of happiness decreased slightly to the disadvantage of the plant-based product. The level of energy, however, did increase for both examined situations, but the improvement was more visible after the plant-based product. The level of stress decreased after animal-based product consumption, and the level of nervousness decreased in both situations but slightly more after animal-based product. After consumption of the animal-based product the increase in the level of annoyance was observed and was higher than the increase of annoyance in the plant-based tasting. This could have been either an effect of the small amount of food influencing the brain, annoyance accompanying answering the questionnaire or some other underlying cause. The level of clear-headedness did decrease after animal-based product consumption. Contentment after animal-based product increased and after plant-based product decreased.

Table 6. Visual representation of mood influences

Mood	After plant-based product	After animal-based product
Satisfaction	↓	↑
Happiness	↓	-
Energy	↑	↑
Alertness	-	-
Stress	-	↓
Annoyance	↑	↑
Nervousness	↓	↓
Tension	-	-
Clear-headedness	-	↓
Contentment	↓	↑

Connected to the last sub-question, ‘to what extent do people prefer plant-based products over their' animal-based equivalent?’ the answers for other survey questions were analyzed. While the majority of the people (14) claimed to prefer the animal-based product, most (11) did not observe a difference in mood change between the two products. After analysing individual answers, no clear connection between dysphoric and euphoric people was observed to influence their choices and convictions.

This research expected that plant-based product will have a better perception among participants. From the analyzed results, it was not the case among the tested group. This hypothesis perhaps could be more accurate in a different or bigger group of people.

Discussed results can be potentially used by food producers to understand what drives consumers towards their products. Even though the shift toward the plant-based diet has been proved to drive companies to adapt to new circumstances and consumers' needs (Chan, n.d.), the research showed that the environmental and health aspects are important for consumers, but not more important than the taste. However, knowing how certain moods are affected by the consumption of certain products can simplify the process of creating a persona and targeting the right audience. It can also be useful in advertising the right products to the right people. Mood marketing is a new technique for increasing brand awareness (Ciragan, 2016). It uses behavioural data (moods) for creating marketing campaigns, matching brands with certain moods, feelings and emotions such as happiness (or contentment). Those products could be marketed better by highlighting the emotions they have an impact on and moods that are important for humans in connection to food. Examples include belonging to a community, health impact, effect on the vitality and more (Hattenbach, 2019). According to Leon Rappoport "Eating is more a matter of the mind than it is the body".

4.5. Product preference

Despite the claimed preference for the animal-based product by the majority of participants, they did not themselves observe better mood effects after its' consumption. The majority reported no difference in mood and well-being when comparing plant-based and animal-based products. This could mean that their preferences were based rather on their own beliefs and taste than on real changes in mood. It was, however, supported by the results of the POMS-like test where greater positive effects on mood were noticed. Whether the outcomes were biased or not, more in-depth research would show evidence for a relationship between the impact of food of different origins on personal mood and palatability.

Chapter 5: Conclusions and recommendations

5.1. Conclusions

This research tested the changes in mood after consumption of plant-based product versus animal-based product.
The overall objective of this study was to assess the satisfaction and contentment level after consumption of animal- and plant-based equivalent products, and learn if there is a difference between them. It was believed that due to the perception of the supremacy of pant-based product above animal ones, participants would prefer the vegan option.
During this study, the overall satisfaction and contentment level after consumption of the animal-based product and its' plant-based alternative were assessed and it was learned that they were more positively influenced by the animal-based product. Consumer's palatability and certain moods were affected more visibly after animal-based product. There were also observable beneficial effects after plant-based product consumption (higher energy levels and clear-headedness), however, many positive moods did not improve and negative ones increased. The majority of the participants preferred animal-based product over the plant-based equivalent.
The majority of participants both consciously when asked and less consciously (from questionnaires analysis) chose animal-based as product of preference. Nevertheless, many people agreed that they appreciate the choice of plant-based alternatives on the market, and consume them. Some believed that they are healthier, others that they are more sustainable and better for the environment. Moreover, certain mood changes were to plant-based product advantages, such as levels of energy or clear-headedness. Despite no evidence of significant changes between mood changes between the two tastings, the animal-based product was rated higher in most of the ranks.
To answer 'how do plant-based alternative foods versus traditional animal-based foods affect the mood and palatability of a consumer?' the statistical analysis was carried out. No significant differences were shown between the samples and therefore it can be concluded that there are not visible differences in how plant-based versus animal-based foods affect the general mood and palatability of a consumer but certain moods may increase and decrease after consumption. Those results show that switching to a plant-based diet is not going to worsen the overall mood of a consumer and that eating vegan product can elevate energy and clear-headedness levels.

5.2. Recommendations

Some sensory properties play an important role in palatability, such as taste, smell, sounds, sight, texture, shape, colour, dimension, temperature, freshness and edibility (Schiffman & Graham, 2000). As the differences in taste and general mouthfeel were one of the most common points raised by the participants, it is advised for the plant-based food producers to work on those aspects. As a short term recommendation, food producers should focus on delivering more meat-like consistency and mouthfeel of vegan alternative products or create products which are not meant to substitute existing animal-based aliments but rather be innovative food that can be eaten in other cultural contexts.
The current results are based on twenty Dutch people's perceptions so might not be representative. It is advised for similar studies in this area to include a bigger and more diverse group for a better and wider overview and test the long-term effects on mood.

The results of this study can be of use for food producers who want to create better products and more targeted advertising. Analysing the mood-food connection, marketers can develop mood marketing strategies to assign certain emotions to their products. This will allow for marketing campaigns more directed toward aimed target groups. Linking plant-based consumption to an increased level of energy and vitality can be a good way to raise awareness and interest of omnivores to try vegan products. This long-term plan could help achieve environmental goals such as Climate Action Plan 2050 in Germany or many more in different countries and communities by decreasing the amount of consumed meat and therefore the number of resources used for its' production. Popularization of plant foods in media backed by researched consumer benefits could be another long-term goal in food marketing and raising awareness among the population.

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Appendices

Appendix 1. Questionnaire

Questions:

1. What is your gender?
   A. Female
   B. Male
   C. Other

2. What is your age?
   A. 18-19
   B. 20-21
   C. 22-23
   D. 24-25

3. Are you a vegetarian, vegan, flexitarian or omnivore?
   A. Vegetarian
   B. Vegan
   C. Flexitarian
   D. Omnivore

4. In what mood are you currently? – The Mood Test - Psychologia.co. (https://psychologia.co/mood-test/)

5. Do you consider yourself an emotional eater?
   A. Yes
   B. No

Palatability & Mood Test (from Appendix 2.)

Animal-based/ Plant-based products tastings

Palatability & Mood Test (from Appendix 2.)

6. Which product did you prefer more and why (open questions)?
   A. Animal-based
   B. Plant-based

7. What is your opinion on plant-based alternatives? (open question)

8. Do you think your mood is better after eating animal-based or plant-based products?

   A. Animal-based
   B. Plant-based
   C. No difference

Appendix 2. Palatability & Mood Test
Rate your feelings on a scale.

Are you feeling satisfied?

1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

Are you feeling happy?

1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

Are you feeling energetic?

1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

Are you alert?

1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

Are you feeling stressed?

1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

Are you feeling annoyed?

1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

Are you nervous?

1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

Are you feeling tense?

1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

Are you clear-headed?

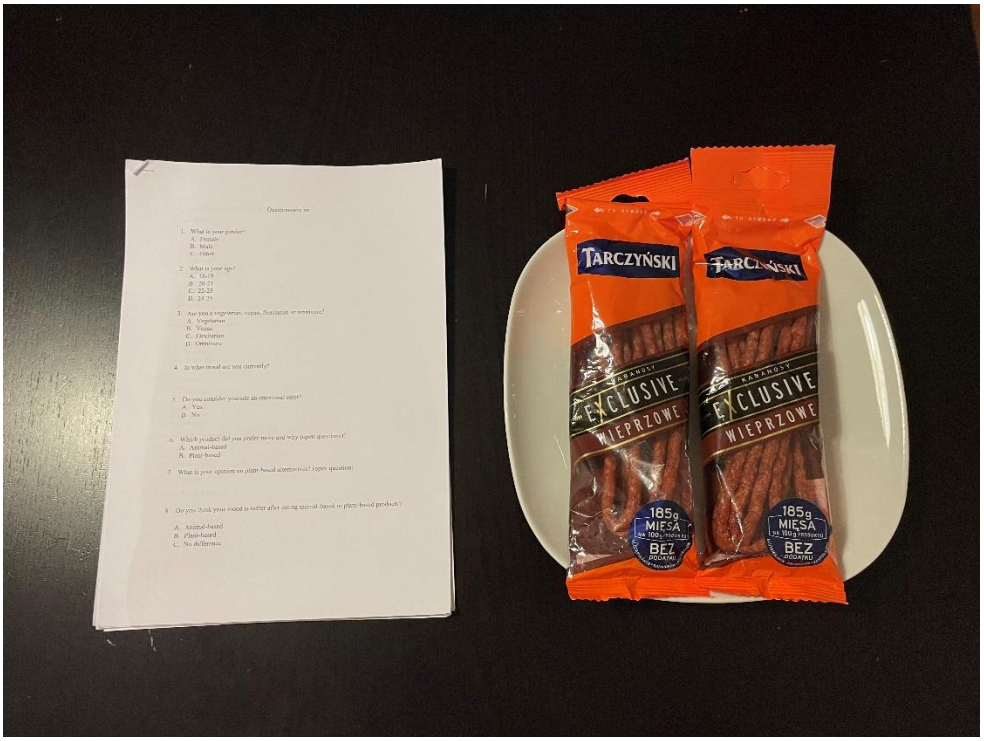
1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

Are you contented?

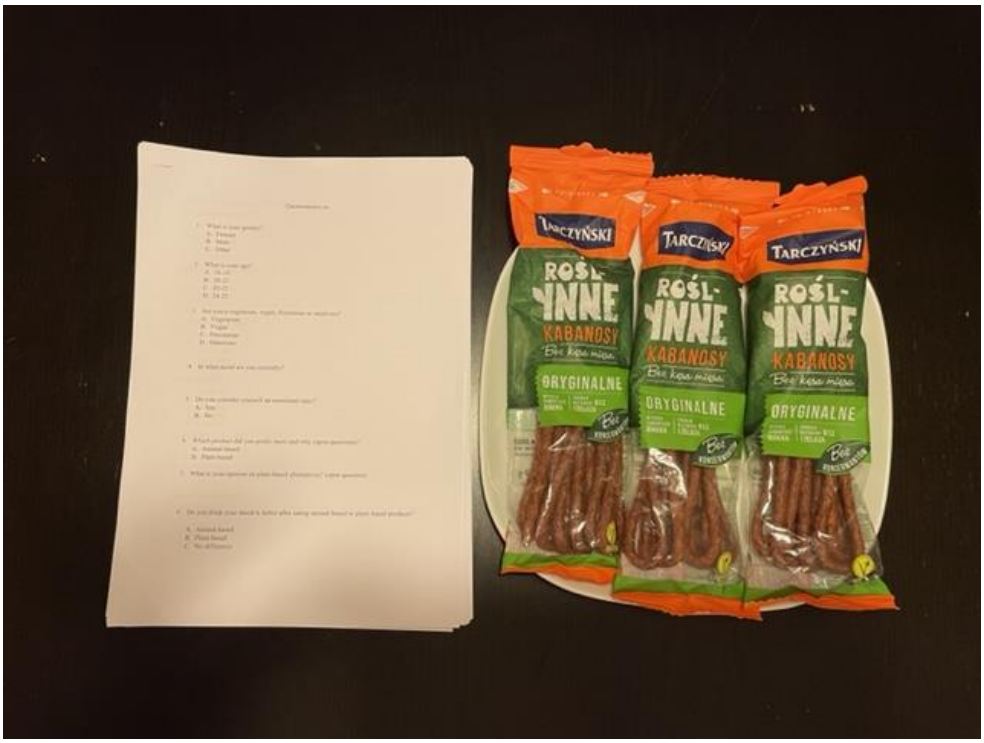
1. Not at all.
2. A little.
3. Moderately.
4. Quite a bit.
5. Extremely

The Palatability & Mood Test is inspired by the POMS Test by brianmack.co.uk (https://www.brianmac.co.uk/poms.htm). The scale of 5 (1-not at all and 5-extremely) is the same for every question. In the analysis, the outcomes after animal-based products and plant-based equivalent will be compared.

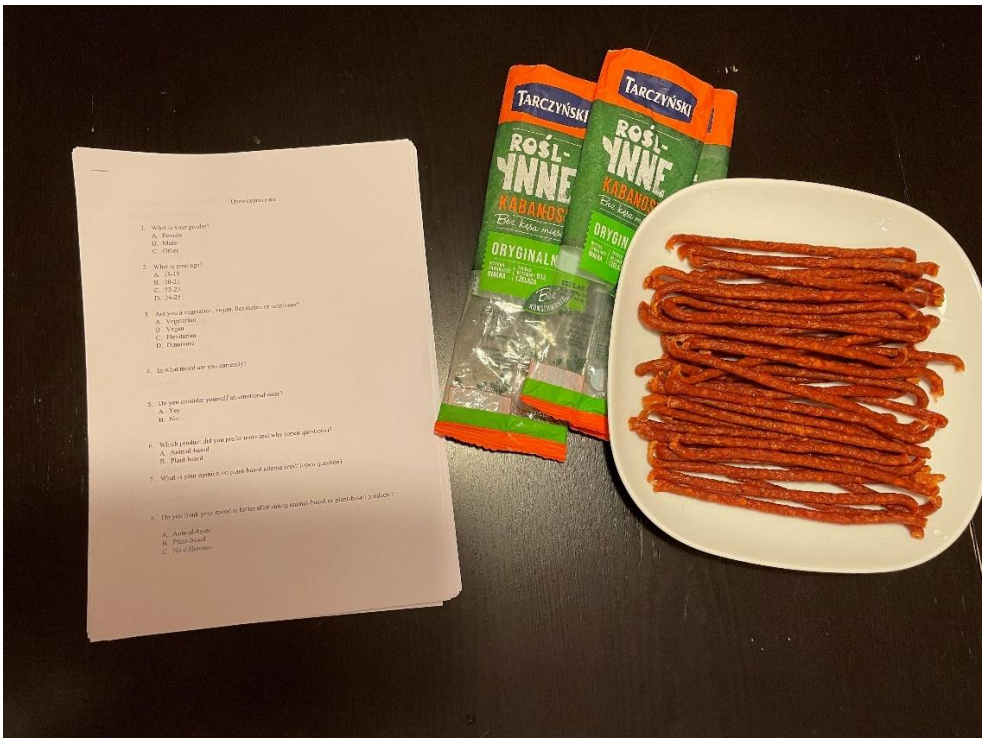
Appendix 3. Tasting set-up



Photograph 1. Animal-based product and surveys.



Photograph 2. Plant-based product and surveys



Photograph 3. Plant-based product on plate.

Appendix 4. Originally retrived data for results

Table 7. Scale used for the tasting survey.

Scale	
not at all	1
a little	2
moderately	3
quite a bit	4
extremely	5

Table 8. Age groups representation among respondents.

age group	Number of people
18-19	9
20-21	7
22-23	1
24-25	3

Table 9. Gender representation among respondents.

gender	number
female	7
males	13

Table 10. Emotional eaters representation among respondents.

emotional eater	number
yes	6
no	14

Table 11. Eating style of respondents.

eating style	people
flexitarian	5
omnivore	15

Table 12. Product preference among respondents.

product preference	number
plant-based	6
animal-based	14

Table 13. Respondents' opinion on mood improvement.

better mood after	number
plant-based	2
animal-based	7
no difference	11

Table 14. Overall general mood data

dysphoria	euthymia	euphoria
5	60	35
10	60	30
20	20	60
5	70	30
5	85	10
5	65	30
15	55	30
5	75	20
5	35	60
30	60	10
5	50	45
5	70	25
20	65	15
5	70	25
25	50	25
10	65	25
25	35	35
5	55	40
20	60	20
5	70	25
11,50	58,75	29,75

Appendix 5. Supporting figures and tables

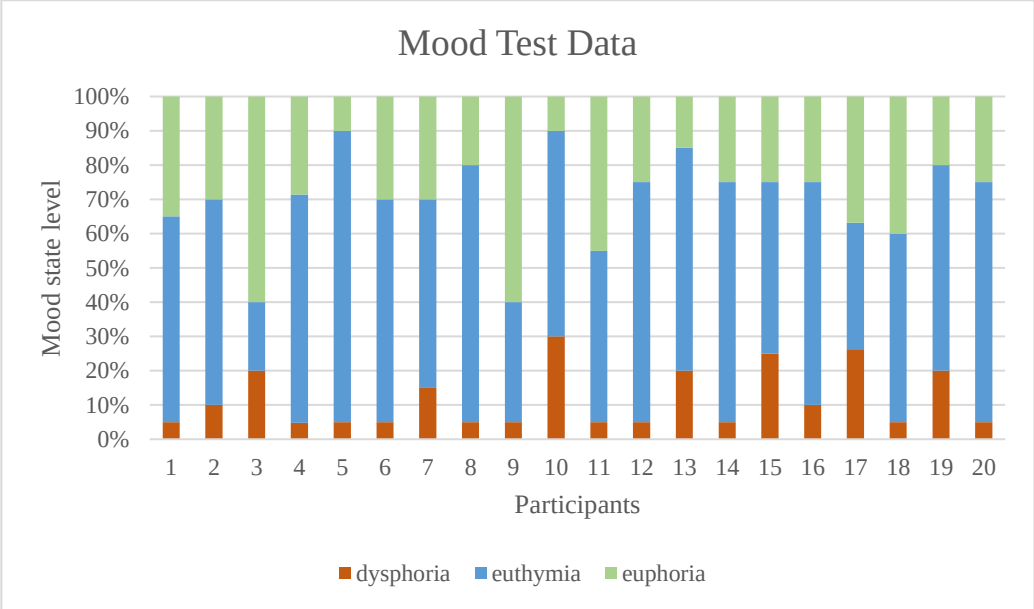


Figure 28. Mood Test Data – overall mood status.

Table 15. Changes in mood states among the participants. (animal-based test)

mood/change	increase	decrease	no difference
satisfied	5	4	11
happy	4	7	9
energetic	5	1	14
alert	4	2	14
stressed	2	5	13
annoyed	3	5	12
nervous	1	3	16
tense	2	8	10
clear-headed	6	5	9
contented	6	3	11

Table 16. Changes in mood states among the participants. (plant-based test)

mood/change	increase	decrease	no difference
satisfied	4	5	11
happy	3	5	12
energetic	7	2	11
alert	3	3	14
stressed	2	3	15
annoyed	3	2	15
nervous	2	3	15
tense	3	3	14
clear-headed	4	4	12
contented	4	8	8

Table 17. Changes in mood levels after consuming an animal-based product.

p/q	satisfaction		happiness		energy		alertness		stress		annoyance		nervousness		tension		clear-headedness		contentment	
	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after
1	2	3	2	4	3	4	3	3	1	1	1	1	1	1	1	1	3	3	3	4
2	3	3	3	4	3	3	4	4	2	1	2	1	2	1	2	1	4	3	2	3
3	3	3	4	4	4	4	4	4	2	1	1	1	1	1	3	4	4	2	3	3
4	2	2	3	3	2	2	2	2	3	3	2	2	2	2	1	2	2	2	3	3
5	1	1	2	1	1	1	1	1	3	1	1	1	1	1	1	1	3	3	2	2
6	4	4	4	4	4	4	4	4	1	1	2	1	1	1	1	1	4	4	4	4
7	4	4	5	5	3	4	4	4	1	1	1	1	1	1	1	1	4	5	3	3
8	4	2	4	3	1	2	2	2	1	1	2	2	1	1	1	1	2	1	4	3
9	4	4	4	4	3	3	4	4	2	2	3	3	2	2	3	2	3	3	4	4
10	3	2	4	3	1	1	2	3	3	2	2	2	1	1	2	2	2	2	3	3
11	2	3	2	3	3	4	2	2	3	1	2	1	1	1	3	2	2	2	1	3
12	4	4	4	5	4	4	3	4	1	2	2	1	1	2	2	2	3	4	5	5
13	2	3	3	3	3	3	4	2	2	2	2	3	1	1	3	2	2	3	3	4
14	3	1	3	2	2	2	2	2	1	1	2	2	2	1	1	1	2	4	3	1
15	4	2	4	3	2	3	2	2	1	1	2	1	1	1	2	1	2	3	3	3
16	4	4	4	4	4	3	4	2	3	3	3	3	2	2	2	2	4	3	4	4
17	4	4	5	5	1	1	3	3	1	1	1	1	1	1	1	2	4	3	3	4
18	3	4	4	4	2	2	3	3	1	1	1	1	1	1	1	1	1	1	3	4
19	4	4	3	4	2	2	4	5	2	2	1	3	3	1	1	3	2	3	3	3
20	3	4	4	1	4	4	3	4	1	3	1	3	1	1	1	2	3	3	3	2
average	3,15	3,05	3,55	3,45	2,6	2,8	3	3	1,75	1,55	1,7	1,7	1,35	1,2	1,65	1,7	2,8	2,85	3,1	3,25

Table 18. Changes in mood levels after consuming a plant-based product.

	satisfaction		happiness		energy		alertness		stress		annoyance		nervousness		tension		clear-headedness		contentment	
p/q	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after
1	3	3	2	4	3	4	3	3	1	1	1	1	1	1	1	1	3	3	3	4
2	2	3	4	4	3	3	4	4	1	1	1	1	2	1	2	2	4	2	2	4
3	3	3	4	4	4	4	4	4	1	1	1	1	1	1	2	4	4	2	2	3
4	2	2	4	4	1	1	2	2	1	1	1	1	1	1	1	1	1	2	4	3
5	3	1	4	2	2	2	2	2	1	1	1	1	1	1	2	2	3	3	3	2
6	4	4	4	4	3	3	4	4	1	1	2	2	1	1	1	1	4	4	4	4
7	4	4	4	5	3	4	4	4	2	1	1	1	1	1	1	1	4	4	3	3
8	4	3	4	2	3	2	3	3	1	1	1	3	1	1	1	1	2	2	4	3
9	3	3	4	4	1	3	3	3	2	2	2	2	1	1	3	2	3	3	4	4
10	4	1	3	3	2	2	2	2	2	2	2	1	1	2	2	2	3	1	1	1
11	2	3	3	3	1	4	1	2	3	1	2	2	1	2	2	2	1	3	2	3
12	4	4	4	4	4	4	3	4	1	4	2	4	1	1	2	2	3	2	5	5
13	2	3	4	4	2	3	3	3	2	2	1	1	1	1	2	2	3	3	4	3
14	3	1	3	2	2	2	2	2	1	1	2	2	2	1	1	1	2	4	3	1
15	2	3	2	2	3	2	3	3	1	1	1	3	2	1	1	2	2	2	4	3
16	4	4	4	4	4	4	4	2	5	2	2	2	2	2	2	2	4	4	4	4
17	4	3	5	4	2	2	3	3	1	1	4	4	1	1	1	3	4	4	3	3
18	3	3	2	3	1	2	3	1	1	1	1	1	1	1	2	1	2	2	4	4
19	4	4	4	2	2	5	5	3	3	3	4	2	1	1	3	2	3	3	4	1
20	4	4	4	4	4	4	1	4	1	4	1	1	1	1	1	1	3	4	3	1
average	3,2	3	3,6	3,4	2,5	3	2,95	2,9	1,6	1,6	1,65	1,8	1,2	1,2	1,65	1,75	2,9	2,85	3,3	3

Appendix 6. Statistical analysis table

Table 19. Wilcoxon Signed Rank Alpha Value

	Alpha value				
n	**0.005**	**0.01**	**0.025**	**0.05**	**0.10**
5	-	-	-	-	0
6	-	-	-	0	2
7	-	-	0	2	3
8	-	0	2	3	5
9	0	1	3	5	8
10	1	3	5	8	10
11	3	5	8	10	13
12	5	7	10	13	17
13	7	9	13	17	21
14	9	12	17	21	25
15	12	15	20	25	30
16	15	19	25	29	35
17	19	23	29	34	41
18	23	27	34	40	47
19	27	32	39	46	53
20	32	37	45	52	60
21	37	42	51	58	67
22	42	48	57	65	75
23	48	54	64	73	83
24	54	61	72	81	91
25	60	68	79	89	100
26	67	75	87	98	110
27	74	83	96	107	119
28	82	91	105	116	130
29	90	100	114	126	140
30	98	109	124	137	151