The effect of a factual confrontation with the meat industry on the willingness to reduce meat consumption

Master Thesis

Behavioural Economics

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Abstract

This study investigated whether a confrontation with uncomfortable pictures and facts about the negative impact of meat production on animal welfare and the environment effectively persuades people to reduce their meat consumption. The theory of cognitive dissonance suggests that people who are confronted often tend to justify their consumption rather than reduce it, to mitigate dissonant feelings. To test this, a randomized controlled trial was conducted. The results indicated no differences in meat-eating justifications between the treatment and control group, implying that such a confrontation neither leads people to justify more, nor to justify less. Furthermore, meat consumption and attachment were found to be positively related with justification, whereas childhood pet ownership was negatively correlated with animal-related justifications. Respondents who took their time to fill in the survey used animal justifications significantly less than respondents who rushed through it, likely indicating a difference in willingness to engage in effortful thinking, also known as need for cognition.

Key words: cognitive dissonance, attitude change, meat consumption, persuasion, animal welfare, environment

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1. Introduction

In recent years, a great deal of research concludes that reducing the consumption of animal products is a vital component of a sustainable lifestyle (de Vries & de Boer, 2010; Hallström, Carlsson-Kanyama & Börjesson, 2015; Macdiarmid, Douglas, & Campbell, 2015). Animal farming is partially responsible for deforestation, biodiversity loss and climate change (Hedenus, Wirsenius & Johansson, 2014; Machovina, Feeley & Ripple, 2015; Recanati, et al., 2015; Stoll-Kleemann & Schmidt, 2017). Aside from the environmental impact, farm animals often do not live their full life expectancy and are kept in unnatural conditions. Roughly 55 billion land-based animals are slaughtered on a yearly basis to be eaten by us (Mitchell, 2011). To be able to sustain the high demand and keep prices low, the conditions in which they live in are often neglected and considered less important. A reduction of meat consumption would therefore be a step in the right direction.

One common method used to persuade meat eaters to reduce their meat consumption is to confront them with daunting facts about the production of meat. Often, this is done in the form of online articles accompanied by pictures (Sinatra, Kardash, Taasoobshirazi, & Lombardi, 2012). Intuitively, confronting people with these facts will educate them and consequently get them to reduce, if not stop, consuming meat. However, it is questionable whether this way of persuasion is effective.

Despite the increase in awareness, recent research conducted by Wageningen University shows that average meat consumption per person in the Netherlands has remained approximately constant between 2015 and 2017, as shown in Figure 1.1 (Dagevos, Verhoog, van Horne, & Hoste, 2018).

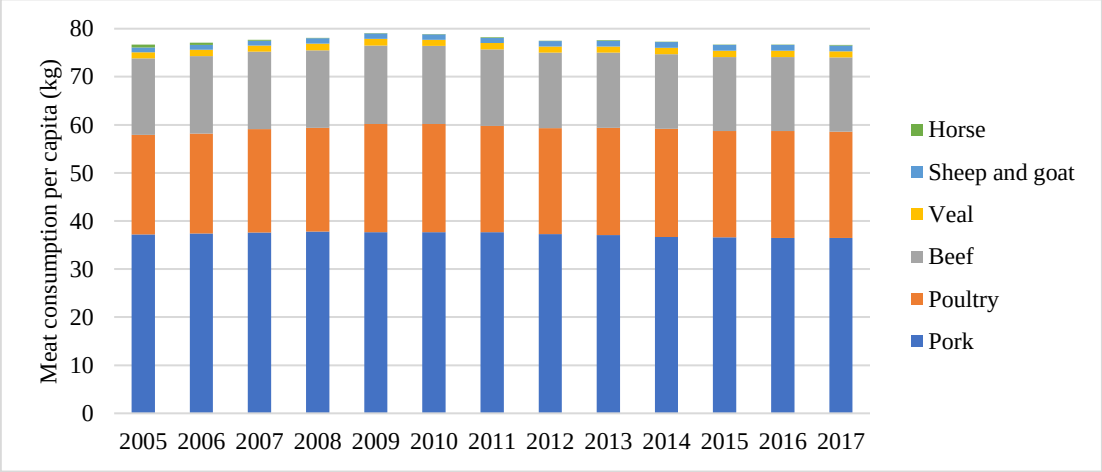

Figure 1.1: Average meat consumption per capita in the Netherlands, 2005-2017 (kg). Source: CBS, calculations by Wageningen Economic Research, cited in Dagevos et al., 2018.

Surely, by now many people have been informed about the negative consequences of meat on the environment and animal welfare, yet they are reluctant to change their behaviour. A theory that could help explain this phenomenon is cognitive dissonance, originally proposed by Leon Festinger (1957). The theory explains that when someone's behaviour contradicts their beliefs, they will experience a mental discomfort, referred to as cognitive dissonance, that they will be motivated to reduce. For example, if someone thinks of themselves as an animal lover who cares about the future of the planet, yet consumes a lot of meat, an inconsistency arises between their belief and behaviour which needs to be resolved. This can happen either by changing their beliefs or by adapting their behaviour.

The theory suggests that if people considerably value their behaviour, they might try to seek reasons to maintain it. In other words, if it is easier to change their belief than their behaviour, then they will look for ways to justify it, even if this behaviour is 'unethical'. Therefore, instead of convincing someone that they should change their behaviour, confronting them with facts which highlight their misconduct might lead them to find ways to justify it. Then not only might this method of persuasion not be effective, it might even have adverse effects.

In this thesis, I am challenging this method of persuasion. To my knowledge, it is the first study to examine the effectiveness of this commonly used persuasion method. It attempts to answer the following research question:

What is the effect of a confrontation with uncomfortable facts and pictures about the ethical implications of meat production on the justification of meat consumption?

To answer it, a randomized controlled trial consisting of two treatments was conducted. The treatments attempted to replicate online articles that are aimed at reducing people's meat consumption. One consisted of images and captions related to meat production's impact on animal welfare and the other is related to its environmental impact. Comparing their effectiveness allows to understand which perspective is most (or least) persuasive.

The results demonstrated that confronting people did not lead them to justify their meat consumption neither using justifications related to animal welfare nor the environment. On the other hand, the level of consumption and attachment to meat was positively related to both types of justifications. In line with the predictions of the theory of cognitive dissonance, people who are more attached to meat presumably find it easier to justify their consumption than to reduce it. Furthermore, people who had pets as children displayed lower animal welfare justifications. This was unsurprising, since research finds these people to be more empathetic

towards animals. Lastly, an exploratory analysis demonstrated that respondents who took longer than the median duration to fill in the survey used significantly less animal welfare justifications. These respondents might be people who enjoy thinking critically about complex issues and be open to adapt their opinions, even if these go against the cultural norms.

The paper proceeds as follows. Chapter 2 dives into literature on attitude formation, the theory of cognitive dissonance and its relationship with meat consumption. Chapter 3 describes the experimental procedure, data and statistical analysis. Chapter 4 presents the results followed by a discussion in Chapter 5. Chapter 6 concludes and provides suggestions for future research.

2. Literature Review

2.1 Attitude formation

In order to examine whether confronting people with uncomfortable facts and pictures is a good way to persuade them to change their attitudes towards meat, it is important to understand the determinants of attitude change.

Social psychologists describe attitudes as being formed by evaluative judgements about people, objects and events (Crano & Prislin, 2006). According to the authors, the dual-process model is the most accurate model that describes the process of attitude change. The model explains that if a persuasive message is well reasoned, data-driven and logical and the receivers of the message are able and motivated to adapt their attitudes, then the message will be successful in persuading the receivers. If the receivers of the persuasive message are either not able to or not motivated enough to change their attitudes, then the message will fail. Thus, the credibility of the message depends on the source of the message, whereas the ability and motivation to adapt an attitude depends on the receiver of the message.

Baumeister & Finkel (2010) find that there are two very important determinants of motivation to process a persuasive message. The first one is the relevance of the message to the receiver. If the message is not relevant, the receiver will not bother to think about it and therefore also not change their attitude. The second one is the receiver's level of need for cognition.

Need for cognition is a personal characteristic that refers to one's desire to engage in effortful and critical thinking (Cacioppo & Petty, 1982). People with a high need for cognition are typically open to new ideas and enjoy thinking critically about complex topics. On the contrary, people with low need for cognition are typically not keen to engage in effortful thinking

(Sinatra et al., 2012). Therefore, people with high need for cognition are more likely to change their attitudes than people with low need for cognition because the latter are not expected to question practices which are deeply engraved in society, such as eating meat.

Sinatra, Southerland, McConaughy, & Demastes (2003) identify need for cognition as an important predictor of acceptance of various scientific theories. This is not surprising, as such theories are usually complex, and questioning them requires critical thinking.

2.2 Cognitive dissonance

The theory of cognitive dissonance was originally proposed by psychologist Leon Festinger in 1957 describing the mental discomfort one experiences when one's beliefs contradict one's behaviour (Festinger, 1962). For example, if someone (let's call her Lisa for convenience) believes that hurting animals is cruel and that she is not a cruel person, yet she eats meat, thereby contributing to the abuse of animals, her beliefs (I am not cruel) and behaviour (I eat animals) contradict. If pointed out to her, this contradiction, or dissonance, between her belief and her behaviour will cause a mental discomfort that she will be motivated to reduce. Festinger suggests that to reduce the dissonance and achieve consonance, people can either change their beliefs or their behaviour. Thus, Lisa will do one of three things to achieve consonance. She will either:

i) change her belief about the idea that eating animals is cruel, or

ii) change her belief about the idea that she is not a cruel person, or

iii) change her behaviour and stop eating animals.

Adapting her beliefs rather than her behaviour will suffice to reduce the dissonance experienced by eating meat, while simultaneously maintain her meat-eating behaviour.

2.2.1 Degrees of dissonance

In order to predict whether someone will adapt their behaviour, it is important to understand that there are differences in the degrees of dissonance one can experience. As quoted by Festinger "If two elements are dissonant with one another, the magnitude of the dissonance will be a function of the importance of the elements" (Festinger, 1962; p. 16). In other words, the more someone values a certain behaviour and the principles that this behaviour contradicts, the larger the dissonance will be.

Broadly, the different levels of dissonance can be categorized as: no dissonance, somewhat dissonance and strong dissonance. Each of these levels will lead to a different behaviour.

Feeling no dissonance after taking a decision suggests that that the person is fully convinced that they made the best possible choice. In other words, this person's behaviour is in line with their belief.

On the other extreme, experiencing dissonance strongly means that the person is not at all sure she made the right decision and is in fact leaning towards changing it. In theory, the maximum possible dissonance one can experience is equal to the resistance to change the less resistant element of the pair (Festinger, 1962). Using the above example, the maximum discomfort Lisa can feel about eating meat is either equal to her willingness to continue eating meat or to her value of the belief that eating meat is cruel, depending on which is easier for her to change. If the dissonance exceeds that threshold, she will either stop eating meat or convince herself that eating meat is not cruel, in order to achieve consonance between her belief and behaviour. Lisa is less likely to stop eating meat the more pleasure she derives from it and the more inconvenient or costly it is for her to stop.

Finally, if someone experiences dissonance somewhat, their behaviour is not completely in line with their beliefs, but that behaviour is more important to them than their beliefs.

Festinger proposes that depending on the degree of dissonance people experience, they will behave differently to achieve consonance. For instance, when people experience dissonance somewhat, in addition to trying to reduce it, they will actively avoid potential dissonance-inducing situations. For example, if Lisa feels somewhat guilty for eating meat, she will avoid talking to vegetarians because they might remind her that by eating meat she is contributing to the slaughter of animals, which would make her feel uncomfortable.

On the contrary, according to Festinger, if people experience dissonance strongly, they will actively seek information supporting a change in behaviour, rather than avoid it. For instance, if Lisa, as an animal lover, feels very guilty about eating animals, she might engage in conversations with vegetarians in order to get convinced of the benefits of this diet and alter her behaviour. Becoming vegetarian will eliminate the dissonance, as her belief (I love animals) and behaviour (I don't eat animals) will be consonant.

Lastly, if people do not feel any dissonance at all, they will not voluntarily expose themselves to either kind of information, as they do not feel the need to reduce or increase the dissonance.

In the situations discussed thus far, people can choose to expose themselves to certain types of information and avoid other types. However, there is a multitude of situations in which people involuntarily get exposed to information such as street protests, news articles or conversations. In these kinds of situations, people act differently. On top of employing dissonance-reducing strategies, they form defensive mechanisms that block the new information from being processed. According to this idea, forcibly exposing people to uncomfortable information in the hope to change their behaviour is rather ineffective. Instead of being persuasive, this type of exposure might make people reject the new information completely (Festinger, 1962).

2.2.2 Cognitive dissonance related to meat consumption

The idea that cognitive dissonance is present among meat eaters has been discussed before. Research in the field shows that carnists frequently experience dissonance from the consumption of meat and use a wide range of dissonance-reducing strategies to justify their meat consumption without having to change their behaviour.

Cognitive dissonance and animal welfare

Research shows that merely presenting vegetarians to meat eaters causes them to experience a dissonance from consuming meat. Rothgerber (2014) conducted an experiment in which he presented a vegetarian to one group of meat eaters and a person following a gluten-free diet to another group of meat eaters. The description of these two people was identical apart from their dietary choices. The researcher found that those exposed to a vegetarian were more likely to perceive emotions as unique to humans and less likely to believe that animals possess mental capacities, than those exposed to a gluten-free person. This suggests that the mere presence of a vegetarian increases the dissonance from meat consumption and thereby also the need to justify eating meat, in this case by denying the animals' emotional and mental capacities.

In a second study, the researcher presented a vegetarian choosing their diet because of moral and health reasons to one group of meat eaters and a vegetarian who is forced to follow this diet due to food allergies to another group of meat eaters. Those presented with a freely choosing vegetarian believed more in the need to eat meat and denied animal pain more than those exposed to an involuntary vegetarian. Again, these results indicate the tendency for carnists to justify eating meat, presumably because they are confronted with the moral question of eating animals.

Similarly, Bilewicz, Imhoff, & Drogosz (2011) demonstrated that meat eaters deny animals certain psychological characteristics and perceive certain emotions to be uniquely human, much more than vegetarians and vegans do.

Another strategy that is used to reduce the discomfort associated with eating meat, is dissociating it from its animal origin. Early research by Signicom indicates that two out of three Dutch consumers are not willing to relate the meat they purchase with its animal origin (as cited in Beekman, Dagevos, van der Weele & de Greef, 2003). This sounds surprising as logically, the first thing that should come to mind when facing the carcass of an animal is the animal itself. However, later research by Hoogland, Boersma and de Boer (2005) confirms this finding by pointing out that meat eaters often mentally disconnect the meat they have on their plate and the animal that meat came from, to eliminate the discomfort of eating it.

In line with this finding, Bratanova, Loughnan and Bastian (2011) illustrate that merely categorizing animals as food reduces people's perception of the animals' ability to suffer. In other words, people tend to think of food animals as less able to feel pain, making it easier to consume them. Indeed, Bastian, Loughnan, Haslam, & Radke (2012) asked people to either eat dried beef or dried nuts and found that those who ate beef attributed cows lower morally relevant capacities than those who ate nuts. Both studies conclude that meat eaters deny commonly edible animals' mental capacities, presumably to justify their consumption.

Cognitive dissonance and the environment

Besides denigrating animals to rationalize meat consumption, research shows that carnists also employ strategies to downplay the environmental impact of meat production.

Tobler, Visscher and Siegrist (2011) found that, although meat consumption and air-imported foods have a bigger impact on the environment, consumers see packaging as being the most harmful. As a result, they evaluate a reduction of meat from their diets as being the least effective way to help the planet. This ignorance partly stems from lack of knowledge but presumably also serves as a strategy to reduce cognitive dissonance associated with eating meat. Indeed, the researchers found a significant negative relationship between level of meat consumed and its perceived negative effect on the environment.

Similarly, Macdiarmid et al. (2015) demonstrate that carnists overestimate the negative effect of food packaging on the environment and heavily underestimate the effect of meat consumption, indicating a lack of awareness around the topic. Even when presented with fact-

based arguments of the detrimental impact of meat production, meat consumers are reluctant to reduce their meat consumption. They justify this decision by claiming that a personal reduction would only make a marginal difference and that other (easier) lifestyle changes would be more effective. Furthermore, respondents defend this reluctance by claiming to eat small quantities in the first place or to have already reduced their meat consumption.

Stoll-Kleemann and Schmidt (2017) identify cognitive dissonance and social norms to be the main barriers when it comes to persuading people to reduce their meat consumption. The authors explain that meat eaters tend to use dissonance-reducing strategies when presented with facts about the detrimental impact of meat on the environment, so that they do not have to deal with negative emotions such as guilt. One such strategy is to use other people's meat consumption as an excuse not to reduce theirs. To overcome these barriers, the authors propose changing the social norms to being vegetarian and vegan friendly so that social pressure to consume meat is diminished. One way that they propose to do this, is by encouraging celebrities and other potential role models who are vegetarian or vegan to publicly express their opinions on the topic more often.

Interestingly, Šedová, Slovák and Ježková (2016) differentiate between 'simple' and 'sophisticated' meat-eating justifications and identify students to primarily use the latter category. For example, students report that despite having great respect for vegetarians and vegans, it is not something they would consider being now, but rather later in life. Such a justification has been termed "promises for improved future behaviour" (Gregory-Smith, Smith & Winklhofer, 2013, p. 1214) and is often used to manage guilt and regret; two frequently occurring emotions arising from the dissonance related to unethical choices. Therefore, even though some studies predict that inducing negative emotions is an effective marketing communication strategy, the authors explain that it might not lead to the desired behaviour change because consumers could resort to dissonance-reducing strategies that mitigate those negative emotions. On the contrary, inducing positive emotions in advertising campaigns might be more effective in motivating consumers to act more ethically (Gregory-Smith et al., 2013).

2.3 Hypotheses

Based on the above literature, the following hypotheses have been devised to help answer the research question:

H_1: Subjects in the animal welfare treatment show a lower willingness to reduce meat consumption than subjects in the control group.

H_2: Subjects in the environmental impact treatment show a lower willingness to reduce meat consumption than subjects in the control group.

3. Methodology

3.1 Experimental design

A randomized controlled trial (RCT) was designed to test whether confronting meat eaters with uncomfortable pictures and facts about the industrial meat production is effective in convincing them to consume less meat. The RCT was conducted in the form of a 5-minute questionnaire, using the online platform Qualtrics.

The survey was distributed through Facebook, Reddit, SurveySwap and WhatsApp. Facebook and Reddit are social media platforms. SurveySwap is an online platform in which students post their surveys and get respondents by filling out others' surveys. Whatsapp is an online messaging platform. In order not to prime respondents, the survey was not advertised as a meat-related study, but rather as "an economic study on decision making".

The survey flow is as follows. First, participants were asked whether they eat meat. Those who answered "no", were sent to the termination page. Those who answered "yes", continued to the rest of the survey, in which they answered questions regarding their level of meat consumption, their attitude towards meat, meat-eating justification (either animal welfare justification or environmental justification) and demographics. To view the complete questionnaire, see Appendix 3.1.

3.1.1 Treatments

Respondents were confronted with pictures demonstrating the negative impact of meat production accompanied by related facts. This approach aims to recreate and subsequently test the effectiveness of online publications intended to inform people of the negative impact of

meat production. Such publications usually highlight the negative implications of meat production on animal welfare and the environment; therefore, two treatments and two control conditions were designed.

Treatment 1: Animal welfare treatment

The first treatment condition (T1) consists of four pictures illustrating the harsh living conditions of cows, calves, chickens and pigs that are raised for slaughter. Each picture is accompanied by a caption, either describing the picture presented or stating a fact about the meat industry. The pictures were shown one by one and the respondents were asked to continue only once they had carefully looked at the picture and read the caption. After viewing the last picture, participants were presented with seven statements regarding meat consumption to which they indicated to what extent they agree or disagree.

Treatment 2: Environmental impact treatment

The second treatment condition (T2) has the same structure as T1. Participants saw four pictures accompanied by captions one at a time and were then presented with seven statements. In this condition, the pictures and captions are related to the negative impact of the livestock industry on the environment. After seeing these, participants were presented with seven statements regarding the impact of meat production on the environment, to which they indicated to what extent they agree or disagree.

Control condition

The purpose of the control condition is to compare the answers given by these participants to the answers of participants in T1 and T2. Therefore, two control conditions were designed: one that is identical to T1, aside from the pictures and captions (CG1) and one that is identical to T2, aside from the pictures and captions (CG2). Each control condition consists of pictures taken during the Syrian war, followed by seven statements. CG1 has the same statements as T1 and CG2 has the same statements as T2. This way, CG1 is identical to T1 aside from the treatment, and CG2 is identical to T2 aside from the treatment. Participants were informed that the statements were unrelated to the pictures they just saw.

The reason for showing participants in the control groups pictures related to the Syrian war was to control for any negative feelings unrelated to cognitive dissonance, that were induced by the pictures shown in T1 and T2. Even though any shocking pictures unrelated to meat

production could have been used, war pictures were selected because they capture human suffering, whereas the pictures in the treatments illustrate environmental and animal suffering.

3.2 Measurements

Due to the limited resources of this study, it was impossible to track the respondents' meat consumption before and after the treatment to determine the effectiveness of the treatments. Furthermore, measuring their level of meat consumption would have likely induced experimenter demand, which is undesirable (Zizzo, 2010). Therefore, instead of measuring behaviour change, meat-eating justification was used as a proxy for (un)willingness to reduce meat consumption. Even though these two measures do not correspond one-to-one, based on the findings presented in section 2.2 justifying meat consumption is likely to be negatively correlated with a subsequent reduction of meat.

3.2.1 Meat-Eating Justification Scale (CG1 and T1)

To measure meat-eating justification related to animal welfare, a scale originally proposed by Rothgerber (2013) was used. The original meat-eating justification (MEJ) scale consists of 27 items and includes nine types of justifications: pro-meat, denial, hierarchical, dichotomisation, dissociation, religious, avoidance, health and human destiny justifications (see Appendix 3.2). Each type of justification is measured by three items. The estimated Cronbach's alpha is 0.85, indicating high reliability (Santos, 1999).

For this study, the original MEJ scale was shortened to seven items to keep the questionnaire concise (see Appendix 3.3). Three items were taken from the denial category and one from the hierarchical, health, human destiny and avoidance categories. These items were found to be most appropriate at measuring meat-eating justification after being shown the negative impact of meat.

The following items were excluded. The dichotomization items did not correlate with the rest, indicating that they might not be measuring justification, so they were subsequently left out. Furthermore, items from the religious justification category were not included as I did not expect those to be frequently used by the respondents of this survey. Moreover, items from the dissociation category can be used as justifications whilst eating meat, but not after reading about the negative impact of meat and are therefore less relevant for this research. For example, "I do not like to think about where the meat I eat comes from" might indeed be a way to deal with eating meat but it is less relevant when presented with pictures about the production of

meat. Therefore, no statements from the dissociation category were used. Lastly, pro-meat items were not included because they are very similar to items from the meat attachment scale, which was presented (as a control variable) before the treatment. If pro-meat items were included, subjects might anchor to their answers from the meat attachment scale, rather than think carefully about them. These items would then not contribute to the measurement of the treatment effect, as respondents would likely answer the same as before the treatment to remain consistent in their answers.

Even though shortening the scale might harm its validity and reliability, using the complete scale would result in a very long questionnaire. In order to estimate the internal validity of the shortened MEJ scale, Cronbach's alpha was estimated (see Appendix 3.4). Due to the limited number of respondents, the scale was not pre-tested on a different sample before being used. Nonetheless, a value of 0.73 suggests that the shortened version of the scale is a somewhat reliable measure, as it surpasses the minimum acceptable value of 0.7 (Santos, 1999).

3.2.2 Adjusted Climate Scepticism Scale (CG2 and T2)

To measure meat-eating justification related to the environment, the climate scepticism scale by Corner, Whitmarsh & Xenias (2012) was adopted. In its original form, this scale consists of 17 items and is used to evaluate people's attitudes towards climate change. (see Appendix 3.5) The Cronbach's α of this scale is 0.92, indicating a high internal consistency (Santos, 1999).

For the purpose of this study, the scale was shortened to seven items and adjusted to measure meat-eating justification (see Appendix 3.6). The items were selected based on their capacity to be rewritten so that they capture scepticism of the environmental impact of meat production. For example, the item "Too much fuss is made about climate change" was converted to "Too much fuss is made about the impact of meat production on the environment".

Just as for the shortened MEJ scale, the reliability of the seven items constituting the adjusted climate scepticism scale (hereafter referred to as environmental impact scepticism (EIS) scale) as a measure of environmental justification is questionable. Therefore, Cronbach's α was estimated to test the internal validity of the scale (see Appendix 3.7). The estimated value of 0.89 suggests that it remains a reliable scale.

For both the MEJ as well as the EIS scale, respondents stated to what extent they agree with each of the seven items using a 7-point Likert scale. The scale ranges from strongly disagree (1) to strongly agree (7) and depending on their answers to each statement, subjects

accumulated points. Strongly disagreeing with all statements resulted in 7 points whereas strongly agreeing with all statements resulted in 49 points. More points represent greater justification.

It is important to note that the MEJ and the EIS measure meat-eating justification and not cognitive dissonance. Previous literature discussed in Chapter 2.2 suggests that one of the ways to deal with dissonance is to justify the behaviour which causes the dissonance. Therefore, if the treatments in this study cause meat eaters to experience a cognitive discomfort, I expect them to rationalize their behaviour by agreeing to the statements presented in the MEJ and EIS scales.

3.2.3 Control variables

The variables described in this subsection are meant to control for factors, besides the treatments, that affect the willingness to reduce meat consumption.

Meat consumption level

Current level of meat consumption is presumably an important determinant of future willingness to reduce meat consumption. It can be argued that those who frequently eat meat have made it a habit. As it is difficult to break strong habits, I expect these people to be less willing to reduce their meat consumption than people who do not consume a lot of meat (Jager, 2003).

Meat-eating respondents were asked to estimate how much beef, pork and chicken they eat in an average week. They selected one of seven options for each type of meat, ranging from ‘less than one time per week’ (1) to ‘15-17 times per week’ (7). Depending on their answers, subjects accumulated points, ranging from 3 to 21. This scale was adopted from Rothgerber (2013) and was slightly adjusted. The original scale does not contain the option ‘less than one time per week’ and the highest possible option is ‘18-20 times per week’. The former was added because otherwise subjects who consume meat less than once per week on average would be categorized with subjects who eat meat up to six times per week. The latter was not used, in order to stay consistent with the seven-answer format of this survey. Even though it is hypothetically possible for someone to eat one type of meat that often, I do not expect the omission of this option to bias the meat-eating justification score.

Meat attachment level

People who are more attached to meat are expected to be more reluctant to reduce their meat consumption for two reasons. Firstly, the more attached someone is to a behaviour, the less motivated they will be to change it. As the dual-self model discussed in section 2.1 predicts, motivation to change behaviour is an important determinant of attitude change. Secondly, people with high attachment to meat are expected to be less informed or care less about the negative impact of meat on animal welfare and the environment.

To measure meat attachment, five items were selected from the Meat Attachment Questionnaire (MAQ) developed by Graça, Calheiros & Oliveira (2015). In its original form, the scale consists of 16 items that the authors divide in four categories: hedonism, affinity, entitlement and dependence (see Appendix 3.8). The complete MAQ measures a Cronbach alpha of 0.92.

For this study, two items from the hedonism category and one of affinity, entitlement and dependence were used to form the meat attachment measure (see Appendix 3.9). When selecting the items, focus was placed on two things. Firstly, that there is at least one item per attachment category and secondly that the selected items are not too similar to those of the MEJ scale. Some statements are very similar, as agreeing to certain justifications is in fact showing high attachment to meat. For example, "meat consumption is a natural act of one's affirmation as a human being" is taken from the MAQ but it is very similar to "it violates human destiny and evolution to give up eating meat", which is part of the MEJ scale. The shortened MAQ scale measures a Cronbach's alpha value of 0.79, indicating that it is internally consistent.

Respondents indicated to what extent they agree with each of the five statements using a 7-point Likert scale, just as for the MEJ and EIS. Respondents with higher scores are inferred to be more attached to meat than respondents with lower scores.

It is worth noting that a crucial assumption that was made for analysis presented in Chapter 4, is that the distance between each answer possibility on the Likert scale is equal. In other words, the distance between, for example, somewhat agreeing and agreeing must be equal to the distance between agreeing and strongly agreeing, as they are all separated by 1 point on the Likert scale. This is important because all the statistical models used are linear, so they assume equal distances between scores.

Demographics and childhood pet ownership

Previous literature finds that certain socio-demographic characteristics such as gender, age, level of education and income are significant determinants of consumers' willingness to reduce meat consumption (Tobler et al., 2011; Yen, Lin, & Davis, 2008). Specifically, men tend to eat significantly more meat than women, and age negatively affects the meat consumption levels of both genders. Moreover, higher educated men eat less meat than lower educated men whereas higher educated women consume more meat than their lower educated counterparts. Consumption of meat increases with income for both genders. To control for the effect of income, employment status was included as a proxy. The advantage of this variable is that it also allows to differentiate between students and non-students, who might be different in their willingness to reduce meat. Lastly, country of origin controls for cultural differences that might partly explain the variation in willingness to reduce meat consumption.

Socio-demographic characteristics aside, research by Rothgerber and Mican (2014) suggests that people who owned pets as children eat significantly less meat as adults than those who did not own pets. A deeper analysis by the researchers, however, shows that empathy towards animals mediates the effect of childhood pet ownership. As the aim is to capture the effect on willingness to reduce meat consumption, childhood pet ownership is included as it makes for a good proxy.

The meat consumption and attachment measures were presented to respondents prior to the treatment, whereas the rest of the controls were presented after the treatment and measurement of justification. It was crucial to measure the frequency and attachment of meat consumption before the treatment for two reasons. Firstly, the treatment could have led people to understate their consumption. Rothgerber (2014) explains that one of the ways by which people rectify eating meat when feeling uncomfortable about it is to understate how much they consume. This way, respondents are expected to have answered truthfully as the option to go back and change answers in the questionnaire was disabled. The second reason is that stating the affinity to meat was expected to enhance the magnitude of the dissonance experienced by the treatment and therefore also the justification. Previous literature shows that the mere act of stating an opinion leads people to support that opinion in the future, in line with the prediction of cognitive dissonance theory (Mullainathan & Washington, 2009).

3.3 Causality and the five precepts for control

3.3.1 Causality

The ideal way to evaluate the causal impact of a treatment on a behaviour would be to observe the behaviour of those exposed to the treatment and compare it to their own behaviour had they not been exposed to the treatment. Such a design would be optimal, because it allows a comparison of behaviours in two identical situations where only one variable is different: the treatment. The estimate of what would have happened, had the subject in the treatment not undertaken treatment, is called the counterfactual (Heckman & Smith, 1995).

If we define:

- Y_{1i} as the potential outcome of individual *i* taking treatment,
- Y_{0i} as the potential outcome of individual *i* not taking treatment, and
- D_i as a dummy variable taking value 1 if *i* is in treatment and 0 otherwise

Then,

(1) $ATE_i = E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 1]$,

where ATE_i represents the average treatment effect, with the latter term being the counterfactual of the former term.

Using experimental data, one can create a counterfactual by designing a control and treatment group, which are identical beside the treatment, and comparing the outcomes of interest. To ensure that the two groups are identical, and therefore be able to infer causality, three conditions must hold (Stoop, 2019):

1. *On average, the treatment and control groups are the same, aside from the treatment.*
2. *Treatment and control react to the treatment in the same way.*
3. *Treatment and control are not exposed to a third factor in isolation.*

The first condition entails that, on average, the control and treatment group should have the same characteristics. This implies that there are no confounding factors influencing the outcome of interest, in this case meat-eating justification. The way to realise this condition is by randomly assigning the respondents into control and treatment. Randomization ensures that respondents do not self-select into the groups and therefore minimizes the chance that individual characteristics are correlated to the treatment (Angrist & Pischke, 2009). In

principle, this condition should hold as the respondents of this survey are randomized into treatments.

Randomizing subjects into treatments also satisfies the second condition. As the chance is minimized that individual characteristics are correlated to the assigned treatments, there is no reason to believe that subjects in the treatment condition react differently to the treatment than those in the control condition, on average.

To illustrate why randomization is essential in estimating the causal effect of treatment, we can pick up the above stated notation and define Y_i as the observed outcome of individual *i*. In the case where subjects self-select into treatment, the observed difference in outcome between the treatment and the control is

(2) $ODO_i = E[Y_i|D_i = 1] - E[Y_i|D_i = 0]$,

where ODO_i is the observed difference in outcome. By simply adding and subtracting the same term and rearranging the equation, it becomes clear that the ODO_i does not give the causal effect of treatment, as it suffers from selection bias. First, adding and subtracting the same term gives

(3) $ODO_i = E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 0] - E[Y_{0i}|D_i = 1] + E[Y_{0i}|D_i = 1]$[1].

Rewriting gives

(4) $ODO_i = \underbrace{E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 1]}_{ATE_i} + \underbrace{E[Y_{0i}|D_i = 1] - E[Y_{0i}|D_i = 0]}_{\text{Selection Bias}}$.

Equation (4) illustrates that simply comparing the outcomes of those who choose to undertake treatment with the outcomes of those who choose not to, gives a biased estimate of the treatment effect. Beside the causal effect of the treatment, such a comparison also includes the effect of individual characteristics on the outcome of interest. These individual characteristics form the selection bias, because they influence the decision to undertake treatment (Angrist & Pischke, 2009). Formally, if the treatment is correlated to individual characteristics, then

(5) $E[Y_{0i}|D_i = 1] - E[Y_{0i}|D_i = 0] \neq 0$, so $ODO_i \neq ATE_i$.

[1] Note that $E[Y_{1i}|D_i = 1] = E[Y_i|D_i = 1]$ and $E[Y_{0i}|D_i = 0] = E[Y_i|D_i = 0]$

People who expect a better outcome when undertaking treatment compared to when not undertaking treatment will self-select into the treatment condition, so there will be a difference in expected outcomes. Randomization of subjects into treatments ensures that the treatments are independent of individual characteristics, as people do not choose whether they undertake treatment. Therefore,

(6) $E[Y_{0i}|D_i = 1] - E[Y_{0i}|D_i = 0] = 0$, so $ODO_i = ATE_i$.

In this case, treatment is independent of individual characteristics on average, so the expected outcomes are the same.

The third causality condition also holds in this study, as the control and treatments are constructed such that they are the same, beside the treatment. Therefore, neither are exposed to an additional factor in isolation.

3.3.2 Five precepts for control

When designing an experiment to measure how certain variables affect behaviour, the experimenter constructs a microeconomic environment which is meant to resemble a real life one. The advantage of such a generated environment compared to observing naturally occurring behaviour, is the ability to achieve control. For this to happen, five precepts must hold (Smith, 1982).

Smith's five precepts are nonsatiation, salience, dominance, privacy and parallelism. The first three are related to incentives. Nonsatiation states that there should be a task-related reward, of which more is preferred to less by the subject. Salience entails that when subjects give correct answers, they should receive more of that reward and that subjects should not be deceived. Dominance requires that the rewards surpass the subjective costs associated with partaking in the experiment. The fourth precept, privacy, states that subjects should only be given information on their own payoffs so that they are not influenced by that of others. Lastly, parallelism, which is an assumption rather than a condition, implies that the general behaviour of individuals in the experiment is in line with real-life behaviour.

In this study, the outcome of interest was measured by the extent to which subjects agree to certain statements. The experimental design does not comply with the incentive-related precepts outlined by Smith, as subjects were not given incentives to answer truthfully. Perhaps the precept that is most likely to be disregarded is dominance, as respondents had an incentive

to complete the survey as quickly as possible, since time is precious, and no incentive to think carefully before responding. To my knowledge, truth-inducing incentivisation mechanisms for non-binary outcomes (such as the Bayesian Truth Serum introduced by Prelec (2004)) are very complex and therefore, unfortunately, out of the scope of this paper. Having said that, as subjects did not receive task-related payoffs, the privacy precept is expected to hold in this study's experiment.

It was, however, possible to implement a reward structure in the form of a fixed show-up fee. The purpose of this was to attract people to the survey and ultimately increase the number of total respondents. In this study, rather than promising respondents the show-up fee, they were given the opportunity to select one of three charities. One respondent was selected at random and €15 was donated to the charity of their choice. The advantage of this variation of a show-up fee, compared to paying it directly to the subject, is that it ensured complete anonymity as subjects did not need to leave their e-mail addresses to receive the money (John, Loewenstein, & Prelec, 2012).

3.4 Data and statistical analysis

This section provides a description of the dataset followed by descriptive statistics and the statistical analysis.

3.4.1 Dataset

344 subjects started filling out the questionnaire. 49 of those were non-meat eaters and could therefore not proceed to fill it in completely. Of the meat-eating respondents, 26 terminated the survey before completion. 17 of those 26 stopped directly after opening the survey and the other 9 stopped at various points throughout the questionnaire. All 26 incomplete observations were removed from the sample so that all the statistical models (described in the following sections) analyse the same sample. Furthermore, initially the option 'other' was included as an option for gender, besides male and female. As only two observations indicated that they identify with this gender, they were excluded for statistical reasons. The following analysis is therefore performed on the 267 remaining observations.

3.4.2 Descriptive statistics

Table 3.1 below provides descriptive statistics for an initial understanding of the data.

Table 3.1. Descriptive statistics of individual characteristics for the complete sample

	N	Mean (SD)	Proportion
Gender	**267**		
Male	129		48.3%
Female	138		51.7%
Education[a]	**267**		
Primary	6		2.3%
Secondary	51		19.1%
Bachelor's degree	132		49.4%
Master's degree	76		28.4%
PhD	2		0.8%
Continent of origin	**267**		
European	203		76%
Non-European	64		24%
Employment	**267**		
Full-time work	64		24%
Part-time work	27		10.1%
Unemployed	14		5.2%
Student	161		60.3%
Retired	1		0.4%
Childhood pet ownership	**267**		
Yes	206		77.2%
No	61		22.9%
Age (in years) [b]	**267**	25.2 (7.4)	

Notes: Proportion rather than mean is shown for all categorical variables.
[a]Education refers to highest level of education achieved.
[b]Age ranges from 15 to 59 years.

Approximately 52% of the participants are female and 48% are male. The subjects originate from 45 different countries and represent 6 continents. Most are from the Netherlands (17%), the United Kingdom (12.4%), the United States (11.6%) and Germany (11.2%).[2] Almost half of the respondents have obtained a bachelor's degree and around 28% have obtained a master's degree, indicating that the majority of the subject pool is highly educated. Additionally, 60% of the sample is currently studying and 34% is employed either full-time (24%) or part-time (10%)[3]. Besides the large proportion of students, the average age of 25.2 years indicates that the sample primarily consists of young adults.[4] Approximately 77% of the respondents had a pet when they were children and 23% did not.

[2] As many respondents originate from different countries, 76% of which are European, the dummy variable Europe was created, indicating whether the subjects originate from a European country or a non-European country.
[3] Since only 1 subject is retired, they were added to the category 'unemployed' for the analysis.
[4] 63% of the sample is aged between 22 and 26 years old.

Table 3.2 provides descriptive statistics of the meat-related control variables and the meat-eating justification scales, by treatment group.

Table 3.2. Descriptive statistics of meat-related controls and justification scales

	Control Group 1		Animal welfare treatment (T1)	
	N	Mean (SD)	N	Mean (SD)
Meat consumption score	67	5.7 (2.1)	65	6.4 (2.5)
Meat attachment score	67	20 (3.4)	65	20.3 (3.8)
MEJ score	67	22.4 (6.9)	65	22.3 (6.3)
	Control Group 2		Environmental impact treatment (T2)	
	N	Mean (SD)	N	Mean (SD)
Meat consumption score	67	5.8 (2)	68	6.5 (2.3)
Meat attachment score	67	19.5 (4.6)	68	20.7 (4.4)
EIS score	67	19.9 (8)	68	20.5 (9)

Notes: The theoretical range of the meat consumption score is 3 – 21 points, that of the meat attachment score is 5 – 35 points and that of the MEJ and EIS scores is 7 – 49 points.

The average meat consumption score of the subjects in CG1 is 5.7 points and slightly higher, 6.4 points, in T1. Similarly, the average meat consumption score is 5.8 and 6.5 points in CG2 and T2, respectively. The mean meat attachment score of CG1 is very similar to that of T1, with 20 and 20.3 points, respectively. On the other hand, subjects in T2 are more attached to meat than those in CG2, on average, as the mean scores are 20.7 and 19.5 points, respectively. Subjects in CG1 and those in T1 seem to justify their meat consumption approximately equally, as the average MEJ score of CG1 is 22.4, with a standard deviation of 6.9 points, and that of T1 is 22.3, with a standard deviation of 6.3 points. The average EIS score of CG2 is 19.9 points and that of T2 is slightly higher at 20.5 points. Both standard deviations are relatively high, 8 and 9 points respectively, indicating a high variance in the respondents' answers[5].

3.4.3 Statistical Analysis

Often, data from experiments do not satisfy the assumptions of parametric tests. In such cases, non-parametric techniques are more appropriate, because they require fewer assumptions. The most important one is that the observations are independent (Nachar, 2008). In this study, this assumption holds if respondents only filled in the survey once and if they did not base their answers on those of others. The former is expected to hold, as it was only possible to fill in the survey once per IP address and there were no two identical observations in the sample. Regarding the latter, as some respondents may be acquainted to each other, it is possible that they filled in the survey together, generating dependent observations. However, as the number

[5] For a more detailed description of the MEJ and EIS scores, box plots are provided in Appendix 3.10.

of respondents that know each other is limited, and the chance that they filled in the survey together is small, this is not expected to pose a threat to the validity of the study. Therefore, the observations are assumed independent at the individual level.

The Mann-Whitney U test was used for the main analysis of the data. It is the most appropriate test, as this study examined whether two independent samples follow the same distribution, and the dependent variable was measured at the ordinal level. All data was analysed using the statistical software Stata/MP 15.

4. Results

This chapter proceeds as follows. In section 4.1 MWU tests are performed and the hypotheses are answered. Section 4.2 presents nonparametric and parametric analyses which are conducted as robustness checks for the main analysis. Section 4.3 consists of exploratory analyses, which investigate additional relationships. Lastly, a power calculation is performed for the main analysis in Section 4.4.

4.1 Main analysis

4.1.1 Hypothesis 1 (T1 vs control)

H1 states that the subjects in the animal welfare treatment (T1) display a lower willingness to reduce meat consumption than the subjects in the control group (CG1). As a high meat-eating justification score likely expresses unwillingness to reduce meat consumption, subjects in T1 are expected to have higher justification scores than subjects in CG1.

To answer this hypothesis, a MWU test was performed. This nonparametric estimator examines if the distributions of the MEJ scores of the two treatment groups are equal[6]. If the animal welfare treatment has no effect on the MEJ scores, then the distribution of the scores will be identical between the treatments.

The results of the MWU test suggest that there is no significant difference between the distribution of the MEJ scores in CG1 and T1 (N_1=67, N_2=65, p=0.85). Therefore, H1 is rejected; subjects in the animal welfare treatment do not display lower willingness to reduce meat consumption than subjects in the control group.

[6] See Appendix 4.1 for the distributions of the MEJ scores.

4.1.2 Hypothesis 2 (T2 vs control)

H2 states that subjects in the environmental impact treatment show a lower willingness to reduce meat consumption than subjects in the control group. Once again, high meat-eating justification scores are expected to indicate unwillingness to reduce meat consumption. This time, justification is measured with environment-related statements.

To answer this hypothesis, again, a MWU test was performed to test if the distributions of the EIS scores of the two treatment groups are equal.[7] The results of the MWU test do not show a significant difference in distributions of EIS scores between CG2 and T2 (N_1=67, N_2=68, p=0.90). Therefore, H2 is rejected; it cannot be concluded that the subjects in the environmental treatment display a lower willingness to reduce their meat consumption than the subjects in the control group.

4.2 Additional analyses

4.2.1 Robustness check using Fisher exact

The MWU test first ranks all scores from lowest to highest and then compares the sum of the ranks between the control group and the corresponding treatment group. It should be noted, that this estimator does not deal well with ties. Since there are a lot more subjects than there are possible justification scores, there will naturally be a lot of subjects with the same score. Therefore, a Fisher exact test was performed as a robustness check for the results of the MWU.

The Fisher exact test examines if two independent sample outcomes are randomly, and therefore equally, assigned over some classes. Originally, the justification score was measured as a continuous variable, meaning that there would be as many classes as there are different scores. Therefore, six classes were created for the justification scores[8], to test if the subjects in T1 and CG1 are equally assigned over the MEJ classes and likewise, if the subjects in T2 and CG2 are equally assigned over the EIS classes. If the treatment has no effect on the subjects' justification scores, then the treatment groups and the respective control groups should be equally distributed over the classes.

[7] Please refer to Appendix 4.1 for the distributions of EIS scores.
[8] This was done both for the MEJ and the EIS scores by dividing the range of each scale by 6 and assigning the corresponding scores to each category.

It is important to note that both the MEJ and the EIS scales were created as continuous variables and dividing the scores into six categories is arbitrary. However, doing so allows to perform an additional nonparametric analysis to verify the findings of the MWU test. Table 4.1 provides the results of the Fisher exact test for H1 and H2.

Table 4.1. Fisher exact tests for equal assignment of treatment groups over justification scores

MEJ score	**Control Group 1**	**Animal welfare treatment (T1)**	**Total**
10-14	10	6	16
15-19	14	19	33
20-24	15	18	33
25-29	18	15	33
30-34	9	5	14
35-39	1	2	3
Total	67	65	132
Two-sided Fisher's exact	p=0.603		
EIS score	**Control Group 2**	**Environmental impact treatment (T2)**	**Total**
7-13	12	17	29
14-20	29	20	49
21-27	12	13	25
28-34	11	15	26
35-41	3	1	4
42-49	0	2	2
Total	67	68	135
Two-sided Fisher's exact	p=0.323		

Notes: The theoretical range of the MEJ and EIS scores is 7 - 49 points.

The null hypothesis of the first Fisher exact test states that the subjects in T1 and CG1 were evenly distributed over the six MEJ classes. As the p-value (0.603) surpasses the 10% significance level, the null hypothesis cannot be rejected. Thus, there is no evidence supporting an unequal distribution of T1 and CG1 over the six classes. This is in line with the results of the MWU test, presented in Section 4.1.1.

The null hypothesis of the second Fisher exact test states that the subjects in T2 and CG2 were evenly assigned over the six EIS classes. This hypothesis cannot be rejected either (p=0.323). Therefore, there is no evidence in support of an unequal distribution of the six EIS classes between T2 and CG2. These results are once again in line with those of MWU, presented in Section 4.1.2.

4.2.2 Robustness checks using parametric estimators

Independent samples t-test

An independent samples t-test was conducted as a further robustness check for the results of the MWU analysis, as it is sometimes considered the parametric alternative to the MWU test. Besides the independent observation assumption, three additional assumptions need to be met for the t-test to be internally valid. The observations need to follow a normal distribution, the variables need to be measured at the interval level and, if two groups are compared, they need to have the same variance (Stoop, 2019).

A Shapiro-Wilk test was conducted to examine if the MEJ data are normally distributed (see Appendix 4.2). The null hypothesis that they are normally distributed is rejected at the 10% significance level (p=0.09). However, if the 5% significance level is used as the benchmark, the null hypothesis cannot be rejected, suggesting they are normally distributed.

Furthermore, a variance-comparison test suggests that the MEJ variance of T1 and CG1 are equal, as the null hypothesis cannot be rejected (p=0.458; see Appendix 4.3).

Moreover, the MEJ data is measured at the interval scale. Thus, all assumptions of the parametric test are satisfied, making it possible to run a t-test and compare the outcome to that of the MWU test.

The null hypothesis of the t-test is that the mean MEJ scores of T1 and CG1 are equal. This hypothesis cannot be rejected (p=0.912, see Appendix 4.4), meaning that there is no evidence to support higher average justification scores in T1 than in CG1. This is consistent with the MWU results, which reject H1.

Since the null hypothesis stating that the EIS scores are normally distributed is rejected at all conventional significance levels (p=0.001, see Appendix 4.2), a parametric test is not appropriate for H2.

Ordinary least squares (OLS)

As discussed in Chapter 3.3.1, random allocation of subjects into treatments theoretically ensures that treatment and control are identical beside the treatment. However, sometimes even with random allocation the two groups end up consisting of different individual characteristics, on average. If this is the case for characteristics that affect meat-eating justification, then a comparison between T and CG will not only give the average effect of treatment, but also the

effect of those individual characteristics. Therefore, it is important to check whether the control variables are evenly distributed between T and CG. To do this, MWU tests were performed for all continuous control variables and Fisher exact tests were performed for all the categorical variables (see Appendix 4.5).

According to the results, there is evidence in support of an unequal distribution of meat consumption score (p=0.074) between T1 and CG1. As the sum of ranks is greater for T1, the results indicate that subjects in T1 consume significantly more meat than subjects in CG1 (at the 10% significance level). There appears to be no significant difference in the distribution of all the other control variables between T1 and CG1. Similarly, the tests indicate that there is no significant difference in distribution of individual characteristics between T2 and CG2, implying that the randomization was successful for the latter two treatments.

MEJ and EIS scores were regressed on the respective treatment dummies[9] and the rest of the control variables using OLS, for two reasons. Firstly, as a robustness check, to examine if the uneven distribution of meat consumption scores biased the MWU results presented in Section 4.1.1. Secondly, to study the effects of the control variables on the justification scores and see if they confirm the expectations outlined in Section 3.2.3.

The main assumptions that need to be satisfied for the OLS to be valid are that the conditional mean is equal to zero, the residuals are normally distributed and homoscedastic and that the model is linear in its parameters.

The zero conditional mean assumption implies that there is no correlation between the error term and the regressors. This assumption cannot be tested, but the most important predictors of meat consumption justification according to the literature are accounted for in the below model. Hence, the analysis is performed under the assumption that predictors of MEJ and EIS scores that are not accounted for are not correlated to the model's regressors.

Furthermore, a Jarque-Bera test was conducted to see if the residuals of MEJ and EIS follow a normal distribution, conditional on the regressors[10] (see Appendix 4.6). The null hypothesis that the residuals are normally distributed cannot be rejected at the 10% significance level for

[9] Treatment dummy T1 took value 1 if the subject was in T1 and 0 if the subject was in CG1. Similarly, T2 took value 1 if the subject was in T2 and 0 if the subject was in CG2.
[10] The Jarque-Bera test was conducted using the residuals of the models controlling for all individual characteristics: Model 3 and Model 6.

neither the MEJ (p=0.395) nor the EIS (p=0.610), suggesting that both residuals follow a normal distribution.

Lastly, the standard error is heteroscedasticity-robust, and the parameters are linear.

Animal welfare treatment (T1)

Table 4.2 below presents the results of the OLS regression for H1. Model 1 shows the effect of the treatment dummy T1 on the MEJ score without controlling for any individual characteristics, Model 2 controls for meat consumption and meat attachment and Model 3 controls for demographics and childhood pet ownership. The coefficient of T1 in Model 1 is -0.13 and it is highly statistically insignificant at the 10% level (p=0.912). The R-squared is 0.0001, suggesting that 0.01% of the variability in MEJ scores is explained by the model. As expected, including the meat affinity variables greatly increases the R-squared (0.44), suggesting that Model 2 is better at explaining the variability in MEJ scores. The R-squared further increases to 0.49 when demographics and childhood pet ownership are included in the model.

The coefficient of meat consumption score in Model 3 is 0.39 and it is statistically significant at the 10% level (p=0.074). This suggests that a 1-point increase in the consumption score increases MEJ by 0.39 points on average, ceteris paribus. However, although the coefficient of T1 in Model 3 decreases in magnitude, it remains statistically insignificant at the 10% level (p=0.233), suggesting that the animal welfare treatment does not affect the justification scores even when accounting for the effect of meat-consumption. Hence, the uneven distribution of meat consumption between T1 and CG1 does not seem to bias the findings of the MWU test presented in Chapter 4.1.1. Model 3 provides no evidence in support of a treatment effect on the MEJ score, which is consistent with the findings of the MWU test.

Table 4.2. Output of the OLS regression with MEJ score as dependent variable

Variables	Coefficient	t	p-value
Model 1			
T1[a]	-0.13 (1.44)	-0.11	0.912
Constant	22.38*** (0.84)	22.67	0.000
R-Squared	0.0001		
Observations	132		
Model 2			
T1[a]	-0.69 (0.88)	-0.79	0.432
Meat consumption score	0.39** (0.19)	2.05	0.042
Meat attachment score	1.05*** (0.95)	11.08	0.000
Constant	-0.88 (2.04)	-0.43	0.667
R-Squared	0.4388		
Observations	132		
Model 3			
T1[a]	-1.03 (0.86)	-1.20	0.233
Meat consumption score	0.39* (0.22)	1.80	0.074
Meat attachment score	1.03*** (0.11)	9.66	0.000
Age	0.05 (0.05)	0.90	0.368
Europe	-2.42* (1.23)	-1.97	0.051
Education[b]			
Less than bachelor's degree	-0.56 (1.63)	-0.34	0.734
More than bachelor's degree	-0.99 (1.71)	-0.58	0.565
Male	-0.49 (1.40)	-0.35	0.726
Education x Male[b]			
Less than bachelor's degree x male	1.51(2.40)	0.63	0.529
More than bachelor's degree x male	2.94 (2.29)	1.29	0.201
Employment status[c]			
Full-time work	-0.17 (1.07)	-0.16	0.876
Part-time work	-1.13 (1.99)	-0.57	0.570
Unemployed	0.30 (2.27)	0.01	0.990
Childhood pet ownership	-2.21** (1.04)	-2.13	0.036
Constant	2.51 (3.11)	0.81	0.422
R-Squared	0.4942		
Observations	132		

Notes: Heteroscedasticity robust standard errors are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.10

[a] Treatment dummy T1 takes value 1 if subject is in T1 and 0 if subject is in CG1.

[b] Bachelor's degree serves as the base category because it contains the most observations.

[c] Student serves as the base category, because it contains the most observations.

Aside from meat consumption, three control variables are statistically significant at the 10% level: meat attachment score (p=0.000), Europe (p=0.051) and childhood pet ownership (p=0.036). The coefficient of meat attachment score is 1.03, indicating that an increase by 1 point increases the MEJ score by 1.03 points on average, ceteris paribus. This is in line with

the expectation that subjects who are more attached to meat will be less willing to reduce their consumption. The coefficient of Europe is -2.42, suggesting that European subjects have 2.42 MEJ points less than non-European subjects on average, keeping everything else constant. To my knowledge, previous literature does not discuss the effect of origin on justifying meat consumption. This variable possibly captures intercontinental cultural differences regarding meat consumption and animal welfare. The coefficient suggests that Europeans are more willing to reduce their meat-consumption than non-Europeans. Lastly, the coefficient of childhood pet ownership (-2.21) implies that subjects who had pets as children scored on average 2.2 points less on the MEJ scale than subjects who did not have pets as children, everything else equal. This is accordant with the expectation that individuals who owned pets in their childhood are more willing to reduce their meat consumption than those who did not own pets.

Age, gender, education level, the interaction between gender and education and employment status are not significant at the 10% level, i.e. they do not significantly affect meat-eating justification. In fact, a joint significance test for the demographic variables indicates that they do not add any explanatory power to Model 3 (see Appendix 4.7).

Environmental impact treatment (T2)

Table 4.3 demonstrates the results of the OLS regression for H2.

Model 4 shows the effect of the treatment dummy T2 on the EIS score when no individual characteristics are controlled for. The coefficient is 0.57 and it is statistically insignificant at the 10% level (p=0.697). The R-squared of 0.0011 suggests that Model 4 explains 0.11% of the variation in EIS score. This value increases to 28.25% in Model 5, which accounts for meat consumption and attachment. In this model, the T2 coefficient becomes negative (-0.78) and remains statistically insignificant at the 10% level (p=0.532). When accounting for demographics and childhood pet ownership, the model explains 32.6% of the variation in EIS score. The coefficient of T2 becomes -0.56 in Model 6 and remains statistically insignificant at the 10% level (p=0.660). Even when controlling for other factors, there is no evidence that subjects who undertook the environmental impact treatment had different EIS scores than subjects who were in the control group, in line with the MWU results presented in Chapter 4.1.2.

Table 4.3. Output of the OLS regression with EIS score as dependent variable

Variables	Coefficient	t	p-value
Model 4			
T2[a]	0.57 (1.47)	0.39	0.697
Constant	19.91*** (0.98)	20.25	0.000
R-Squared	0.0011		
Observations	135		
Model 5			
T2[a]	-0.78 (1.24)	-0.63	0.532
Meat consumption score	0.32 (0.29)	1.10	0.275
Meat attachment score	0.96*** (0.17)	5.54	0.000
Constant	-0.66 (3.18)	-0.21	0.832
R-Squared	0.2825		
Observations	135		
Model 6			
T2[a]	-0.56 (1.26)	-0.44	0.660
Meat consumption score	0.55* (0.32)	1.75	0.083
Meat attachment score	0.94*** (0.19)	4.92	0.000
Age	0.02 (0.09)	0.19	0.846
Europe	1.07 (1.51)	0.71	0.481
Education[b]			
Less than bachelor's degree	1.42 (2.19)	0.65	0.519
More than bachelor's degree	-0.85 (2.36)	-0.36	0.719
Male	-3.33* (1.88)	-1.77	0.080
Education x Male[b]			
Less than bachelor's degree x male	2.28 (3.61)	0.63	0.528
More than bachelor's degree x male	3.18 (3.22)	0.99	0.325
Employment status[c]			
Full-time work	0.79 (2.01)	0.40	0.693
Part-time work	-2.14 (1.83)	-1.17	0.243
Unemployed	-1.68 (2.42)	-0.69	0.489
Childhood pet ownership	0.34 (1.67)	0.21	0.837
Constant	-2.09 (4.40)	-0.48	0.635
R-Squared	0.3255		
Observations	135		

Notes: Heteroscedasticity robust standard errors are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.10

[a] Treatment dummy T2 takes value 1 if subject is in T2 and 0 if subject is in CG2.

[b] Bachelor's degree serves as the base category because it contains the most observations.

[c] Student serves as the base category, because it contains the most observations.

Regarding the remaining variables in Model 6, meat consumption score, meat attachment score and gender are statistically significant at the 10% level. The coefficient of meat consumption score is 0.55 (p=0.083), suggesting that a 1-point increase increases EIS score by 0.55 points on average, ceteris paribus. The coefficient of meat attachment score is approximately 0.94

(p=0.000). A 1-point increase in meat attachment score increases the EIS score by 0.94 points on average, keeping all other factors constant. Both effects are in line with the expectation that individuals with a higher affinity to meat are less willing to reduce their consumption. The coefficient of the variable male is -3.3 (p=0.080), indicating that men have 3.3 EIS points less than women on average, ceteris paribus. Education does not seem to affect the EIS score for either genders, contrary to the findings of previous literature. Similarly, age, continent of origin, employment status and childhood pet ownership do not influence EIS score, as they are not statistically significant at the 10% level.

4.3 Exploratory analysis

4.3.1 Survey duration

As explained in Section 3.3.2, subjects were not incentivized to respond truthfully, meaning they could be filling out the survey quickly, without carefully looking at the treatment. In that case, even if the treatment affects justification scores, it would not show for the subjects who responded very quickly, as they were not properly exposed to the treatment.

To test if the treatments affected the justification scores of subjects who took enough time to fill out the survey two analyses were conducted. Firstly, the sample was restricted to respondents who took longer than four minutes to fill out the survey and a MWU test was performed. Four minutes served as the cut-off value because it was the sample's median survey duration. The MWU test examined if the justification scores of subjects who took longer than four minutes to fill out the survey follow the same distribution in T1 and CG1 and T2 and CG2.

The results of the MWU tests provide no evidence of a different distribution of justification scores neither between T1 and CG1 (N_1=34, N_2=33, p=0.26), nor between T2 and CG2 (N_1=34, N_2=35, p=0.40). Hence, restricting the sample to subjects who took longer than four minutes to complete the survey does not alter the conclusions of the main MWU analyses of Section 4.1.1 and 4.1.2.

The second analysis was conducted in the form of a linear regression. Models 3 and 6 were regressed once again, this time including the dummy variable 'overfour', indicating if the subject took over four minutes to complete the survey. This was done to examine the treatment effect on the MEJ and EIS scores whilst controlling for the duration of the survey, without restricting the sample. The results are displayed in Table 4.4.

Table 4.4. Output of the OLS regression controlling for survey duration

	Model 7 - MEJ scores			Model 8 - EIS scores		
Variable	**Coefficient**	**t**	**p-value**	**Coefficient**	**t**	**p-value**
T1/T2[a]	-1.03 (0.84)	-1.23	0.221	-0.53 (1.26)	-0.42	0.678
Overfour	-2.47*** (0.83)	-2.97	0.004	1.12 (1.39)	0.81	0.421
Meat consumption score	0.42** (0.20)	2.10	0.038	0.53 (0.33)	1.62	0.107
Meat attachment score	0.96*** (0.11)	8.58	0.000	0.92*** (0.19)	4.80	0.000
Age	0.47 (0.05)	0.94	0.349	0.01 (0.09)	0.08	0.935
Europe	-2.46** (1.18)	-2.08	0.040	0.89 (1.51)	0.59	0.556
Education[b]						
Less than bachelor's degree	-0.74 (1.57)	-0.47	0.637	1.50 (2.23)	0.67	0.504
More than bachelor's degree	-1.28 (1.73)	-0.74	0.459	-0.53 (2.46)	-0.22	0.830
Male	-0.04 (1.31)	-0.03	0.974	-3.21* (1.90)	-1.69	0.093
Education x Male[b]						
Less than bachelor's degree x male	1.61 (2.35)	0.69	0.495	1.98 (3.60)	0.55	0.584
More than bachelor's degree x male	3.23 (2.30)	1.41	0.162	2.92 (3.30)	0.88	0.379
Employment status[c]						
Full-time work	-0.27 (1.10)	-0.25	0.806	1.00 (2.06)	0.49	0.626
Part-time work	-0.80 (1.92)	-0.42	0.678	-1.83 (1.85)	-0.99	0.326
Unemployed	0.06 (2.26)	0.03	0.978	-1.73 (2.40)	-0.72	0.470
Childhood pet ownership	-2.02** (0.95)	-2.13	0.036	0.31 (1.67)	0.19	0.852
Constant	4.58 (3.22)	1.42	0.157	-2.02 (4.42)	-0.46	0.649
R-Squared	0.5259			0.3293		
Observations	132			135		

Notes: Heteroscedasticity robust standard errors are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.10

[a] Treatment dummy T1 (T2) takes value 1 if subject is in T1 (T2) and 0 if subject is in CG1 (CG2).

[b] Bachelor's degree serves as the base category because it contains the most observations.

[c] Student serves as the base category, because it contains the most observations.

The coefficient of overfour in Model 7 demonstrates that, keeping everything else equal, those who took longer than four minutes to complete the survey have on average 2.47 MEJ points less than those who took less than four minutes, ceteris paribus (p=0.004). The coefficient of the treatment dummy remains unchanged from Model 3 (-1.03) and is statistically insignificant at the 10% level (p=0.221).

These results suggest that, keeping the treatment condition constant, those who spent more time thinking about their answers justified meat consumption less than those who rushed through the survey. However, even when controlling for the duration of the survey, there seems to be no treatment effect on the MEJ score for the unrestricted sample. Once again, the results are assent with the main results of the MWU test.

Turning to Model 8, the coefficient of overfour is statistically insignificant at the 10% significance level (p=0.421), as is the coefficient of T2 (p=0.678). This suggests that there was no significant difference in environment-related justification scores between subjects who took more than four minutes and subjects who took less than four minutes to fill out the survey. Moreover, even when accounting for the duration of the completion of the survey there is no evidence in support of a treatment effect on EIS scores. Thus, the conclusion of the main analysis presented in Chapter 4.1.2 does not change when accounting for the subjects who potentially filled in the survey too quickly.

4.3.2 Academic education

A study conducted by Šedová et al. (2016) suggests that students following an academic education might not justify meat consumption by being sceptical or ignorant about its detrimental effect on the environment or by denying the pain it causes animals because they have been educated otherwise. Their way of rationalizing eating meat is more complex, for example by overestimating their reduction of meat consumption over the past years. If this is the case, then the items used to measure meat-eating justification in this study, which are mainly related to denial and scepticism, might not capture the justification used by academic respondents. On the contrary, lower educated respondents might use the simpler justification strategies of this survey to rationalise their meat consumption, meaning that the treatment might only induce this group to justify. As the sample consists of 79% university educated people, the non-academic group would be too small for the treatment effect to be statistically significant in the OLS models presented above.

To test if either of the treatments affect meat-eating justification for non-academic people, the sample was restricted to subjects who did not complete a university education and two MWU tests were conducted. These examined if the distribution of MEJ and EIS scores differ between T1 and CG1 and T2 and CG2, respectively, for non-university educated people.

The first MWU test suggests that there is no significant difference between the MEJ score distribution in CG1 and T1 (N_1=15, N_2=16, p=0.36). Similarly, the second MWU test provides no evidence of a different EIS score distribution between CG2 and T2 (N_1=14, N_2=12, p=0.33). Hence, the conclusions remain the same as for the unrestricted sample.

Due to the low number of observations it is not possible to perform parametric tests for this analysis. Even though such a low number is not optimal for the validity of any statistical test,

nonparametric estimators suffer less than parametric estimators in this respect. Having said that, the MWU results of the restricted sample should be interpreted with caution.

4.4 Statistical power calculation

A post-hoc power calculation assesses the probability of rejecting a false null hypothesis. Two calculations were performed for the main analyses[11]; one for the analysis of H1 and one for H2 (see Appendix 4.8). These calculations merely serve as approximations, as they assume that the analyses were conducted using parametric t-tests. The results show that both analyses are severely underpowered, as they measure powers of 0.102 (H1) and 0.124 (H2); both of which are well below the conventional level of 0.8. These can be interpreted as follows: given the obtained sample size, effect size and α equal to 0.10, the probability of correctly rejecting the null hypothesis of the MWU test conducted for H1 would be 10.2%. Similarly, this probability would be 12.4% for the MWU analysis conducted for H2.

5. Discussion and limitations

5.1 General Discussion

This study starts by proposing that confronting meat eaters with facts and images of the destructive effect of meat production will make them justify their reasons for eating meat, rather than reduce it. The results of the main analysis and the robustness checks provided no evidence in support of a treatment effect on either type of meat-eating justification. In other words, confronting carnists with uncomfortable facts and images about the negative effects of meat production on animal welfare and the environment did not lead them to justify their meat consumption. This is surprising, since other research indicates that they often use similar justifications as the ones provided in this study to rationalise their consumption of meat.

Several reasons might explain why the hypothesized treatment effect was not found. Firstly, it could be that subjects did not feel cognitive dissonance when they were confronted with the treatments. Assuming that the treatments accurately imitated online articles aimed at persuading carnists to reduce their meat consumption, this would suggest that inducing negative emotions does not lead people to legitimize their ‘unethical’ choices as the cognitive dissonance theory predicts. However, it also does not make them more critical towards these

[11] The power calculation was conducted using the software G*Power on the MWU tests described in Chapters 4.1.1 and 4.1.2.

choices, which is the aim of the articles. If this were the case, then subjects who undertook the treatments would have justified less than subjects in the control groups, which was not the case. Therefore, according to this paper's findings, one could argue that demonstrating the negatives of meat consumption to meat eaters does not affect their attitude towards its consumption.

It is possible that such a confrontation only shows its effect in the long-term, i.e. that there is a lagged effect. Maybe the treatments do not cause people to think or respond any differently immediately, but only after having some time to process the information. After all, it can be expected that some time is necessary to evaluate new information which condemns a behaviour that is so engrained in society and everyday life.

A third possibility is that subjects who were exposed to the treatment felt cognitive dissonance, but they did not justify their meat consumption using the items provided in the questionnaire. Research shows that there are many ways in which people can justify 'unethical' habits in order to maintain them. The justification items used in this questionnaire only capture a few of these ways, so if the treatments caused subjects dissonance which they dealt with differently than proposed by the items, then it would not show using the current measurement.

For instance, Šedová et al. (2016) propose that students might use more sophisticated ways to justify their consumption because they simply cannot deny factual statements that they have learned to be true. Aside from students, anyone who has researched the production of meat might be too informed to agree with statements such as "I do not believe that meat production is damaging the environment" and "animals don't really suffer when being raised and killed for meat", regardless of the treatment they undertook. Then, even if the treatments did cause dissonance, it would not show in the justification scores because these, at least partly, reflect on the respondents' knowledge of the topic rather than the undertaken treatment.

It seems paradoxical that so many meat eaters agree with facts explaining that meat causes harm in different ways yet continue eating it. This paradox is somewhat unsurprising however, as it has been previously identified as the "attitude-behavioural intention gap", which describes the situation where consumers say one thing but do another (Vermeir & Verbeke, 2006). In his book, Leenaert (2017) recounts a story in which a moral philosophy professor preaches that there is no moral justification for eating the meat of factory-farmed animals for years yet continues to consume meat herself. Accordingly, there might be discrepancies between people's responses and their behaviours, which are impossible to identify without measuring their meat consumption post-treatment.

Regarding the effects of individual characteristics, meat consumption and attachment are positively related to both types of justifications, following the expectations outlined in Chapter 3. This is in line with the theory of cognitive dissonance, because meat lovers find it harder to reduce their consumption, making it easier for them to justify it instead. The effect of meat consumption on justification is slightly higher in T2 than in T1, whereas the effect of meat attachment is very similar.

Furthermore, as expected, childhood pet ownership is negatively correlated with animal-welfare justification but not with environmental justification. This makes sense, because empathy towards animals was only expected to influence the animal-related justifications; having had a pet is unrelated with environmental concerns.

Subjects that took longer than four minutes to fill out the survey used significantly less animal-related justifications than those who took less than four minutes to fill it out. One explanation for this could be that the ones who took time to carefully think about their answers have a high need for cognition. As discussed in Chapter 2.1, people with high need for cognition enjoy thinking critically about the status quo and are therefore more likely to change their attitudes about topics that others might find easier to avoid, such as eating meat. This finding might be interesting for meat-reduction campaigns, who may find targeting their message to people with high need for cognition a good strategy, as it could affect these people the most.

University education was not a factor in the extent to which subjects were influenced by the treatment. It led neither academics nor non-academics to justify their meat consumption more than their control group counterparts, once again confirming no effect of treatment.

Overall, this research paper sheds light on the effectiveness of a common persuasion technique. It shows that, despite it not having adverse consequences, it also does not seem to have the desired effect, at least in the short term. Understanding this might help social movements related to animal advocacy and environmental protection as well as policy makers in their attempt to persuade people to reduce their consumption of meat.

5.2 Limitations

The main limitation of this study is the lack of experimental control. As it was not possible to incentivize subjects to truthfully fill in the questionnaire, Smith's three incentive-related precepts for control (nonsatiation, salience and dominance) do not hold. As a result, it is not possible to be certain that subjects spent enough time thinking about their answers.

Furthermore, this study's sample is not representative of the general population. Majority of the respondents were friends and family and as a result the sample mainly consists of highly educated young adults. This does not harm the internal validity of the main analysis because this examined differences between T and CG, and randomization ensured that the two groups are identical in terms of characteristics. However, a representative sample would improve the external validity if they would respond differently to the treatment than the current sample did. For instance, if the treatment would have affected older or lower educated people differently, the results would differ. A representative sample would give a better idea of the effect of a confrontation with uncomfortable facts and pictures on the general population's attitudes towards meat consumption.

A further limitation is that both scales that were used to measure meat-eating justification were shortened. The initial MEJ scale consists of 27 items and the original EIS scale of 17 and both scales were shortened to 7 to keep the questionnaire concise. However, using the full extent of the scales and thereby increasing the number of possible justifications would have been more accurate as it would have been able to detect dissonance-reducing strategies that were now not captured. Moreover, the EIS scale was initially a climate change scepticism scale that was modified to measure scepticism regarding the environmental impact of meat production. The shortened, modified version was not pre-tested on a different sample, meaning that its measurement of environment-related justification is questionable.

Another limitation is related to the numeric scale used to measure justification scores. In order to calculate one's degree of justification, answers to each of the seven statements were summed. This implies that someone who answered "neither agree nor disagree" for each statement because they did not have an opinion on them accumulated the same number of points as someone who answered the same because their opinion truly lay in the middle. Subsequently, these answers are taken to mean the same, even though they represent different situations. Including an option for those who did not want to give an answer to the statement could potentially solve for this issue and make the justification measurement more accurately reflect the respondents' opinions.

A fifth limitation is that this study's experiment lacks statistical power. Two ways to increase it would be by having a larger sample size and by reducing the variance of the error term. An increased budget would allow for a greater reward structure which would presumably attract more respondents. A way to reduce the variance of the error term would be by 'blocking' on

some individual characteristic and then randomizing the respondents into treatments within that block. However, even though this would lead to a more homogenous sample it would also reduce the external validity of the study.

6. Conclusion

Many online attempts to persuade carnists to reduce meat consumption are made in the form of news articles combined with pictures (Sinatra et al., 2012). Often, such articles demonstrate the negative effect of meat on animal welfare and the environment. Despite these attempts, meat consumption has remained stagnant over the past years, implying that this communication method might be ineffective. Supporters of the theory of cognitive dissonance would not find this surprising because it predicts that, when confronted with such facts, many meat eaters will justify their behaviour rather than change it.

The study at hand assesses the effectiveness of this persuasion method by imitating such online articles and evaluating their effect on meat eater's attitude towards meat consumption. Both the animal welfare and environmental perspective are taken, to assess which is more effective (or destructive). The results of a randomized controlled trial suggest that a confrontation with the distressing reality of meat production does not lead people to justify their meat consumption any more than the control group. However, such a confrontation does not lead people to justify their consumption any less either, suggesting that it is not a strong persuasion technique.

Consumption and attachment to meat were found to be positively correlated to justification, indicating that cognitive dissonance might play a role there. Additionally, childhood pet ownership was negatively correlated with animal welfare justifications, which could be mediated by empathy towards animals. Lastly, respondents who took longer than the median time to fill in the survey had significantly lower animal related justification scores. These are likely people with a high need for cognition, i.e. those who enjoy questioning everyday practices, such as eating meat.

Overall, this study gives social movements and policy makers insights into the effectiveness of a very common communication strategy as well as information about the determinants of meat-eating justification. Understanding both could be a useful step towards the normalization of cruelty-free food.

In the future, researchers could examine whether the place and time of a confrontation with the negative impact of meat production plays a role in the carnists' degree of justification. For instance, prior to the confrontation they could ask people to remember the last time they had a barbecue, list all the types of meat they ate and briefly describe the whole experience. This would possibly create a larger cognitive dissonance, as the respondents just had to describe all the ways in which they enjoyed behaving 'unethically'. If this would make people justify more, and therefore make them less willing to reduce their consumption, then anti-meat demonstrations in the summer in an area where people barbecue might not be optimal in persuading them to stop eating meat.

Additionally, it would be interesting to study the long-term effects of multiple confrontations on people's willingness to reduce meat consumption. This could be done by showing subjects multiple articles, or recreations thereof, at various points in time and then asking them to fill in the justification statements one week, two weeks and one month after the last confrontation, for instance. Several numbers of confrontations and timing variations could be tested to estimate the optimal exposure and time necessary to process the information. Using more justification items or even asking open questions about their opinions towards meat consumption could be more accurate at measuring the treatment effect than just using a few items. To prevent learning effects, or that the subjects deliberately remain consistent in their opinions across time, different treatment groups could be asked about their meat consumption attitudes at different points in time, maintaining a between-subject design. Such a study would be, to my knowledge, the first to thoroughly evaluate the impact of a communication strategy that is used very frequently, but whose success is questionable.

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Appendix

Appendix 3.1 – The complete survey

Welcome!

Thank you for taking part in this survey.

Your participation in this survey is completely **voluntary** and **anonymous**. You can decide not to participate or stop participating at any time. I will treat your data **confidentially** and only use it for **scientific purposes**. This survey is part of my Master Thesis at the Erasmus School of Economics.

Filling in this survey will take you approximately **5 minutes**. At the end of the survey, you will get the chance to select one of three charities. Once all responses have been recorded, I will choose one participant at random and donate €20 to the charity of their choice.

If you have any questions, please do not hesitate to contact me at 408782jh@student.eur.nl.

Thank you for your participation,

Jari Hoogstins

Q1. Do you eat meat? *(Options: yes; no)*

Q2. (For those who answered "no" in Q1)

I am conducting research on decision making regarding meat consumption. Therefore, this survey is intended for respondents who consume meat.

Thank you for participating. Please click next to terminate survey.

(Those who answered "yes" in Q1 continued to the rest of the survey)

Q3. Please answer the below questions to the best of your knowledge.

1. **Please estimate how many times in an average week you eat beef.**
2. **Please estimate how many times in an average week you eat pork.**
3. **Please estimate how many times in an average week you eat chicken.**

(Scale: Less than 1 time per week; 1-2 times per week; 3-5 times per week; 6-8 times per week; 9-11 times per week; 12-14 times per week; 15-17 times per week)

Q4. Please indicate to what extend you agree with the below statements.

1. **I am a big fan of meat.**
2. **To eat meat is disrespectful towards life and the environment***
3. **According to our position in the food chain, we have the right to eat meat.**
4. **Meat is irreplaceable in my diet.**
5. **To eat meat is one of the good pleasures in life.**

(Scale: Strongly disagree; Disagree; Somewhat Disagree; Neither agree nor disagree; Somewhat agree; Agree; Strongly Agree)

Q5. Treatment

(Subjects randomly got assigned to one of the four treatments below)

Treatment 1

Now, you will be presented with some pictures taken inside animal farms. These are real living conditions of animals which are destined to be slaughtered for their meat.

Please click next once you have carefully looked at the picture and read the caption.

7,800,000,000 kilos of bovine (beef and veal) meat was produced in the European Union in 2017. Even though a cow's natural life expectancy is around 20 years, beef cattle only live around 2 years before being slaughtered.

Often, they spend majority of their lives living in small, indoor spaces.

→ *12*

[12] Caption sources: (Eurostat, 2018; Four Paws in US, n.d.)
Picture source: (McArthur, n.d.)

Calves are often taken away from their mothers very soon after they are born to be raised for veal. Calf cattle only live 8 months, on average, before being slaughtered for their meat.

→ *13*

This picture was taken in a free-range, organic, family-run chicken farm in Spain.

→ *14*

[13] Caption source: (Four Paws in US, n.d.)
Picture source: (McArthur, 2010)
[14] Picture source: (McArthur, n.d.)

Pigs often spend their whole lives indoors, rarely seeing the light of day.

This picture is taken in a pig farm in Italy.

→

15

Q7. Now, I will present you some statements regarding your opinion on meat consumption. Please indicate to what extent you agree with each statement.

Q8. Please indicate to what extent you agree with the statement below.

1. **Animals don't really suffer when being raised and killed for meat.**
2. **It's acceptable to eat certain animals because they're bred for that purpose.**
3. **I try to stay away when people start talking to me in graphic terms about how the animals we eat suffer.**
4. **We need the protein we can only get in meat for healthy development.**
5. **It violates human destiny and evolution to give up eating meat.**
6. **Animals feel pain the same way humans do.***
7. **Meat is processed so that animal pain and discomfort is minimized and avoided.**

(Scale: Strongly disagree; Disagree; Somewhat Disagree; Neither agree nor disagree; Somewhat agree; Agree; Strongly Agree)

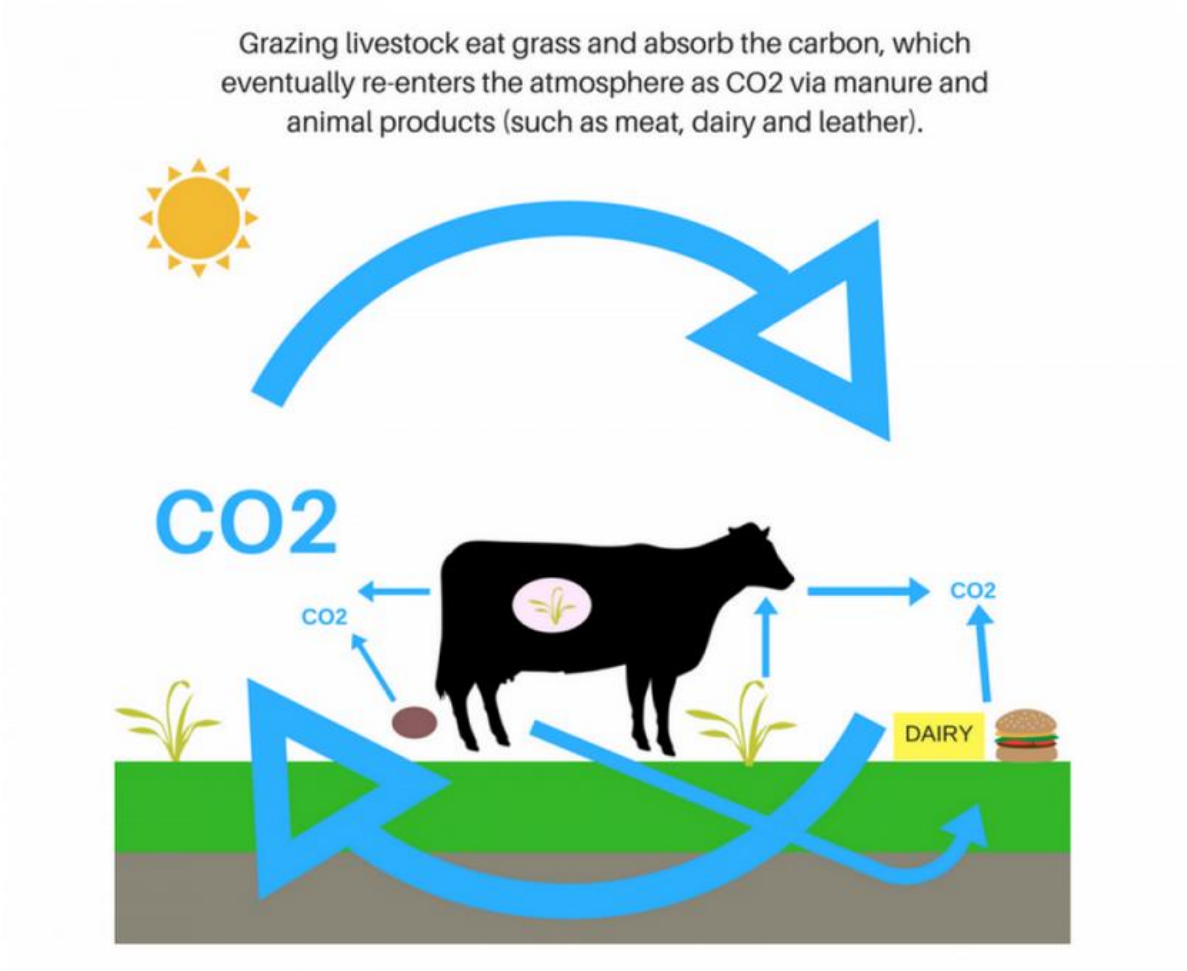
[15] Picture source: (McArthur, 2015)

Treatment 2

Now, you will be presented with some pictures related to the environmental impact of the livestock industry. These pictures show the impact that meat production has on the environment.

Please click next once you have carefully looked at the picture and read the caption.

Research conducted by English newspaper *The Guardian* found that the top 20 meat and dairy companies emitted more greenhouse gases in 2016 than all of Germany, Europe's biggest climate polluter by far.



→

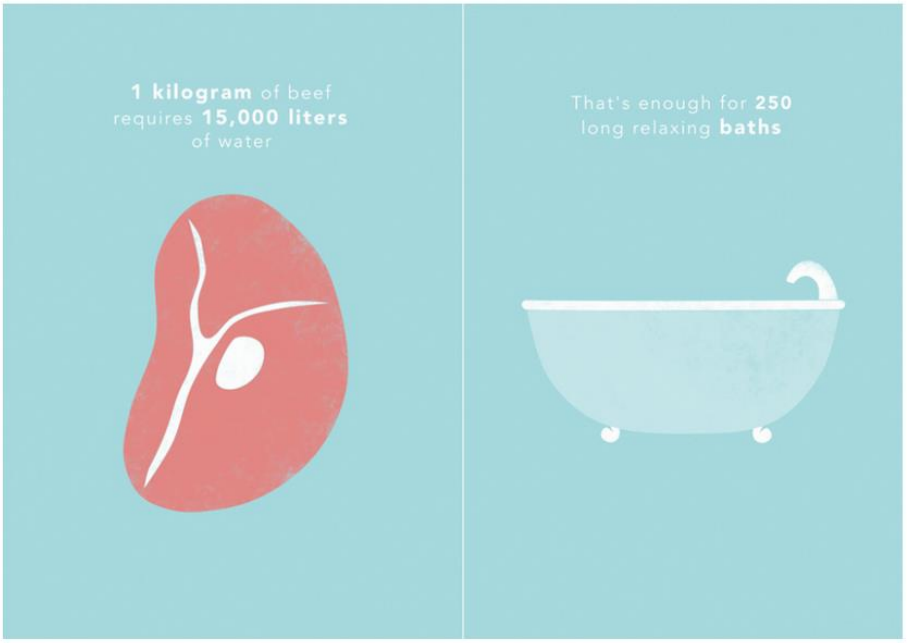
16

[16] Caption source: (Majot & Kuyek, 2017)
Picture source: (New Zealand Agricultural Greenhouse Gas Research Centre, 2017)

In 2017, an area of forest the size of Italy was destroyed, in large part to clear land for raising cattle destined for human consumption. The majority of trees were felled in the Amazon and the Democratic Republic of Congo.

→ *17*

Research shows that around 15,000 liters of water are required to produce 1 kg of beef, around 6,000 liters for 1 kg of pork and more than 4,000 liters for 1 kg of chicken meat. In contrast, it takes around 1,800 liters to produce 1 kg of pasta, 1,500 liters for 1 kg of wheat and 287 liters for 1 kg of potatoes.



→ *18*

[17] Caption and picture source: (Meat Free Monday, 2018)
[18] Caption source: (The Guardian, 2013)
Picture source: (Hydrotech, n.d.)

In the past 20 years, an area the size of two Germanys has been cut from the Amazon rainforest. In this ancient rainforest, deforestation is largely driven by agriculture. Specifically, in the Brazilian region of the Amazon, around 80 percent of deforestation is caused by cattle ranching and this rate increased by 29 percent in the past year alone.

→

19

Q7. Now, I will present you some statements regarding the impact of meat production on the environment. Please indicate to what extent you agree with each statement.

Q8. Please indicate to what extent you agree with the statement below.

1. **Claims suggesting that meat production is detrimental for the environment are exaggerated.**
2. **I do not believe that meat production is damaging the environment.**
3. **There is too much conflicting evidence about the effects of meat production on the environment to know what is actually happening.**
4. **I am convinced that the environment is negatively affected by the production of meat.***
5. **The evidence for a negative effect of meat production on the environment is unreliable.**
6. **Too much fuss is made about the impact of meat production on the environment.**
7. **It is too early to say whether the production of meat really contributes to the destruction of the planet.**

(Scale: Strongly disagree; Disagree; Somewhat Disagree; Neither agree nor disagree; Somewhat agree; Agree; Strongly Agree)

[19] Caption and picture source: (Good, 2017)

Control Group 1

Now, you will be presented with some pictures taken during the war in Syria. These are real conditions people have to live in at a time of war.

Please click next once you have carefully looked at the picture and read the caption.

As of March 2019, roughly 5.7 million Syrians have fled the country, according to the UN High Commissioner for Refugees, and more than 6.1 million people are displaced internally. [20]

→

[20] Caption source: (CNN Library, 2019)
Picture source: (Mashhadi, 2016)

Inside Syria, one in four schools have been damaged, destroyed or converted into emergency shelters. Less than half of elementary-school-aged children are enrolled in school.

→ 21

A Syrian man evacuated an infant from a rebel-held town after heavy bombardment. As the Syria war drags on, growing more diffuse and complex, many international monitoring groups have stopped counting casualties.

→ 22

[21] Caption source: (UNHCR, 2018)
Picture source: (Al-Shimale, 2019)
[22] Caption and picture source: (Eassa, 2018)

Millions of Syrians have lost their homes due to the war.

→ [23]

Q7. Now, I will present you some statements regarding your opinion on meat consumption. Please indicate to what extent you agree with each statement.

These statements are unrelated to the pictures you just saw.

Q8. Please indicate to what extent you agree with the statement below.

1. **Animals don't really suffer when being raised and killed for meat.**
2. **It's acceptable to eat certain animals because they're bred for that purpose.**
3. **I try to stay away when people start talking to me in graphic terms about how the animals we eat suffer.**
4. **We need the protein we can only get in meat for healthy development.**
5. **It violates human destiny and evolution to give up eating meat.**
6. **Animals feel pain the same way humans do.***
7. **Meat is processed so that animal pain and discomfort is minimized and avoided.**

(Scale: Strongly disagree; Disagree; Somewhat Disagree; Neither agree nor disagree; Somewhat agree; Agree; Strongly Agree)

[23] Picture source: (Papagiorcopulo, 2017)

Control Group 2

(The same pictures and captions were presented to subjects in CG2. However, these subjects were presented with different statements)

Q7. Now, I will present you some statements regarding the impact of meat production on the environment. Please indicate to what extent you agree with each statement.

These statements are unrelated to the pictures you just saw.

Q8. Please indicate to what extent you agree with the statement below.

1. **Claims suggesting that meat production is detrimental for the environment are exaggerated.**
2. **I do not believe that meat production is damaging the environment.**
3. **There is too much conflicting evidence about the effects of meat production on the environment to know what is actually happening.**
4. **I am convinced that the environment is negatively affected by the production of meat.***
5. **The evidence for a negative effect of meat production on the environment is unreliable.**
6. **Too much fuss is made about the impact of meat production on the environment.**
7. **It is too early to say whether the production of meat really contributes to the destruction of the planet.**

(Scale: Strongly disagree; Disagree; Somewhat Disagree; Neither agree nor disagree; Somewhat agree; Agree; Strongly Agree)

(All respondents answered the following questions)

Q9. What is your age?

(*Options: Male; Female; Other)*

Q10. What is your country of origin?

(*Open question)*

Q11. What is the highest level of education you have completed?

(*Options: primary school; secondary school; bachelor's degree; master's degree; PhD; other, namely:)*

Q12. What is your current employment status?

(*Options: Employed full-time; employed part-time; unemployed; student; retired; other, namely:)*

Q13. Did you own a pet as a child?

(*Options: yes; no)*

Q14. Please select one of the three charities below. Once all responses have been recorded, I will randomly select one participant and donate €15 to the charity of their choice.

(*Options: War Child; Farm Animal Sanctuary; Rainforest Action Network)*

(Q14 was not mandatory)

Appendix 3.2 – The original MEJ Scale (Rothgerber, 2012)

Meat-Eating Justification (MEJ) Scale

1. I enjoy eating meat too much to ever give it up. (PRO-MEAT)
2. Animals don't really suffer when being raised and killed for meat. (DENY)
3. It's acceptable to eat certain animals because they're bred for that purpose. (HIER. JUST.)
4. To me, there is a real difference between animals we keep as pets and animals we eat as Food. (DICHOT.)
5. When I look at meat, I try hard not to connect it with an animal. (DISSOC.)
6. God intended for us to eat animals. (REL. JUST.)
7. I try not to think about what goes on in slaughterhouses. (AVOID)
8. Meat is essential for strong muscles. (HEALTH JUST.)
9. It wouldn't surprise me to learn that scientists believe the human body (e.g., our teeth) has evolved to eat meat. (HD/FATE JUST.)
10. Meat tastes too good to worry about what all the critics say. (PRO-MEAT)
11. Animals do not feel pain the same way humans do. (DENY)
12. Humans are at the top of the food chain and meant to eat animals. (HIER. JUST.)
13. It seems wrong that people in some cultures eat dogs and cats. (DICHOT.)
14. I do not like to think about where the meat I eat comes from. (DISSOC.)
15. God gave us dominion over animals. (REL. JUST.)
16. I would have problems touring a slaughterhouse. (AVOID)
17. We need the protein we can only get in meat for healthy development. (HEALTH JUST.)
18. It violates human destiny and evolution to give up eating meat. (HD/FATE JUST.)
19. There is no food that satisfies me as much as a delicious piece of meat. (PRO-MEAT)
20. Meat is processed so that animal pain and discomfort is minimized and Avoided. (DENY)
21. Ultimately, animals are here to serve our needs. (HIER. JUST.)
22. I am more sensitive to the suffering of house pets like cats and dogs than other wild animals. (DICHOT.)
23. When I eat meat, I try not to think about the life of the animal I am eating. (DISSOC.)
24. It is God's will that humans eat animals. (REL. JUST.)
25. I try to stay away when people start talking to me in graphic terms about how the animals we eat suffer. (AVOID)
26. We need meat for a healthy diet. (HEALTH JUST.)
27. Our early ancestors ate meat, and we are supposed to also. (HD/FATE JUST.)

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Appendix 3.3 – The shortened, 7-item MEJ Scale

1. Animals don't really suffer when being raised and killed for meat.
2. It's acceptable to eat certain animals because they're bred for that purpose.
3. I try to stay away when people start talking to me in graphic terms about how the animals we eat suffer.
4. We need the protein we can only get in meat for healthy development.
5. It violates human destiny and evolution to give up eating meat.
6. Animals feel pain the same way humans do.*
7. Meat is processed so that animal pain and discomfort is minimized and avoided.

Notes: * = Reverse-scored item.

Appendix 3.4 – Cronbach's alpha of the 7-item MEJ Scale

Table A3.1. Chronbach's a of the 7-item MEJ scale

Average interim covariance	0.7073
Scale reliability coefficient	0.7342

Appendix 3.5 – The original Climate Scepticism Scale (Corner, Whitmarsh & Xenias, 2012)

1. Climate change is too complex and uncertain for scientists to make useful forecasts.
2. Claims that human activities are changing the climate are exaggerated.
3. The media is often too alarmist about issues like climate change.
4. I do not believe climate change is a real problem.
5. Floods and heatwaves are not increasing, there is just more reporting of it in the media these days.
6. Climate change is just a natural fluctuation in Earth's temperatures.
7. It is too early to say whether climate change is really a problem.
8. There is too much conflicting evidence abut climate change to know whether it is actually happening.
9. Too much fuss is made about climate change.
10. The evidence for climate change is unreliable.
11. Many leading experts still question if human activity is contributing to climate change.
12. I am uncertain about whether climate change is really happening.
13. There is solid evidence that the Earth is warming up because of human activities.*
14. Recent floods and heatwaves in this country are due to climate change.*
15. I am convinced that climate change is really happening.*
16. Experts are agreed that climate change is a real problem.*
17. Changes in climate over the last 100 years are mainly caused by human activities.*

Notes: * = Reverse-scored item.

Appendix 3.6 – The adjusted, 7-item Environmental Impact Scepticism (EIS) Scale EIS

1. Claims suggesting that meat production is detrimental for the environment are exaggerated.
2. I do not believe that meat production is damaging the environment.
3. There is too much conflicting evidence about the effects of meat production on the environment to know what is actually happening.
4. I am convinced that the environment is negatively affected by the production of meat.*
5. The evidence for a negative effect of meat production on the environment is unreliable.
6. Too much fuss is made about the impact of meat production on the environment.
7. It is too early to say whether the production of meat really contributes to the destruction of the planet.

Notes: * = Reverse-scored item.

Appendix 3.7 – Cronbach's alpha of the 7-item EIS Scale

Table A3.7. Chronbach's a of the 7-item EIS scale

Average interim covariance	1.1709
Scale reliability coefficient	0.8857

Appendix 3.8 – The complete MAQ (Graça, Calheiros & Oliveira, 2015)

1. To eat meat is one of the good pleasures in life.
2. I love meals with meat.
3. I'm a big fan of meat.
4. A good steak is without comparison.
5. By eating meat I'm reminded of the death and suffering of animals*
6. To eat meat is disrespectful towards life and the environment.*
7. I feel bad when I think of eating meat.*
8. Meat reminds me of diseases.
9. To eat meat is an unquestionable right of every person.
10. According to our position in the food chain, we have the right to eat meat.
11. Eating meat is a natural and undisputable practice.
12. I don't picture myself without eating meat regularly.
13. If I couldn't eat meat I would feel weak.
14. I would feel fine with a meatless diet.*
15. If I was forced to stop eating meat I would feel sad.
16. Meat is irreplaceable in my diet.

Notes: * = Reverse-scored items.

Appendix 3.9 – The shortened, 5-item MAQ

1. I am a big fan of meat.
2. To eat meat is disrespectful towards life and the environment*
3. According to our position in the food chain, we have the right to eat meat.
4. Meat is irreplaceable in my diet.
5. To eat meat is one of the good pleasures in life.

Notes: * = Reverse-scored items.

Appendix 3.10 – Box plots of the MEJ and EIS Scale by treatment

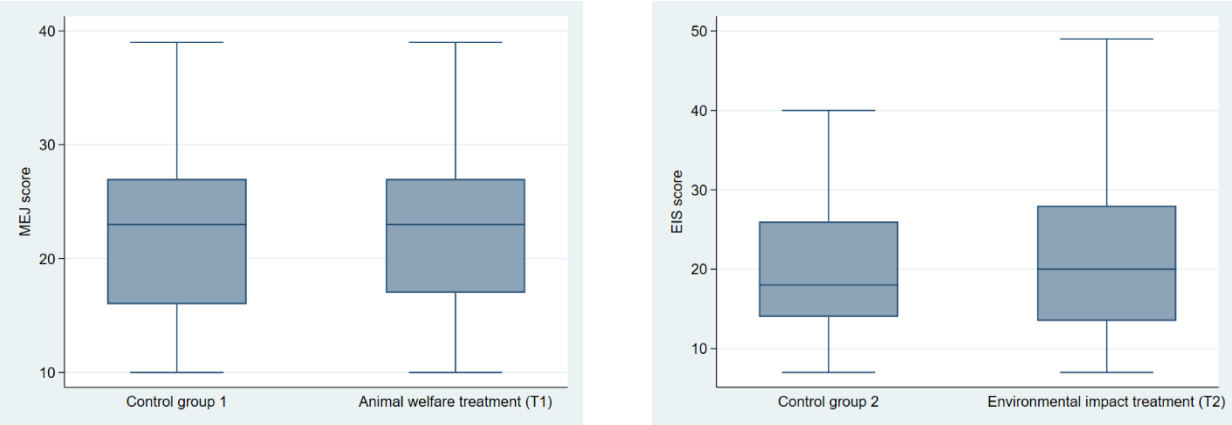

Figure A3.1: Box plots of MEJ and EIS scores by treatment.

Notes: The line inside the box represents the median. The box represents the inter-quartile range (scores of 50% of the sample). The upper whisker represents the maximum score in the sample. The space between the upper whisker and the box represents the top 25% of the scores in the sample. The lower whisker represents the minimum score. The space between the lower whisker and the box represents the bottom 25% of the scores in the sample.

Appendix 4.1 – Histograms showing the distributions of MEJ and EIS scores by treatment.

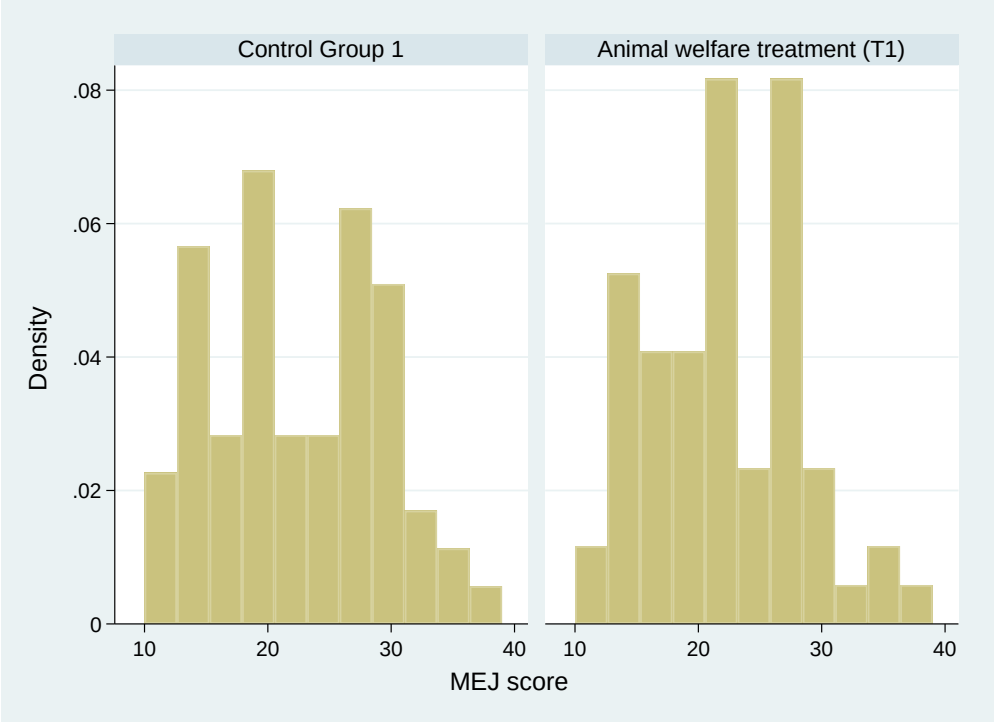

Figure A4.1: Distribution of MEJ scores by treatment

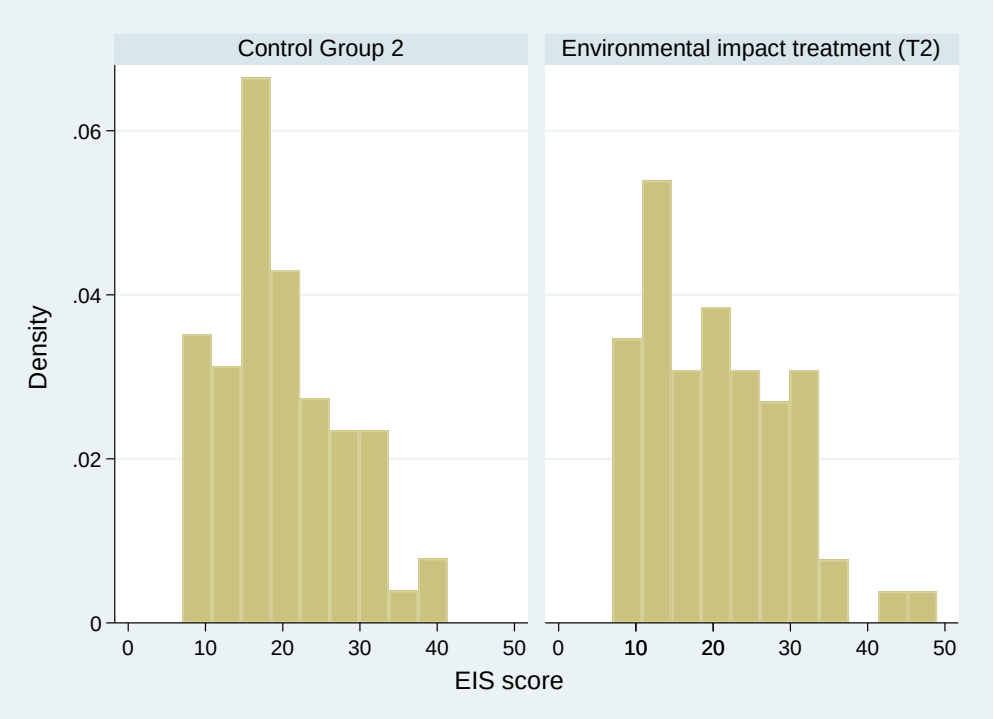

Figure A4.2: Distribution of EIS scores by treatment

Appendix 4.2 – Shapiro-Wilk test for normality of MEJ and EIS scores.

Table A4.1. Shapiro-Wilk test for normality of MEJ and EIS scores

Dependent variable	N	z	Prob>z
MEJ scores	132	1.29	0.098
EIS scores	135	3.01	0.001

Notes: H_0: Data is normally distributed.

Appendix 4.3 – Variance comparison test of MEJ scores between CG1 and T1.

Table A4.2. Variance comparison test of MEJ scores between CG1 and T1

	MEJ score		
Treatment	**N**	**Mean**	**Standard deviation**
Control Group 1	67	22.39	6.871
Animal welfare treatment (T1)	65	22.26	6.263
2-tailed P(F>f)	0.458		

Notes: H_0: sd (CG1) / sd (T1) = 1

Appendix 4.4 – Independent samples t-test of MEJ scores as a robustness to the main analysis.

Table A4.3. Independent samples t-test of MEJ scores between CG1 and T1

	MEJ score		
Treatment	**N**	**Mean**	**Standard deviation**
Control Group 1	67	22.39	6.871
Animal welfare treatment (T1)	65	22.26	6.263
t	0.111		
2-tailed P(T>|t|)	0.912		

Notes: H_0: mean (CG1) - mean (T1) = 0

Appendix 4.5 – MWU and Fisher exact tests to examine if the control variables are evenly distributed between treatments and control groups.

Table A4.4. MWU and FE tests for equal distribution of individual characteristics between treatments

	Control Group 1		Animal welfare treatment (T1)		Mann-Whitney U
Continuous variables	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**P > |z|**
Meat consumption score	67	5.7 (2.1)	65	6.4 (2.5)	0.074
Meat attachment score	67	20 (3.4)	65	20.3 (3.8)	0.566
Age	67	26.1 (7.7)	65	25.5 (8.4)	0.121
Categorical variables	**N**	**Proportion**	**N**	**Proportion**	**Fisher's Exact**
Gender	**67**		**65**		
Female	38	56.7%	34	52.3%	0.727
Male	29	43.3%	31	47.7%	
Education	**67**		**65**		
Less than bachelor's degree	15	22.4%	16	24.6%	
Bachelor's degree	35	52.2%	30	46.2%	0.808
More than bachelor's degree	17	25.4%	19	29.2%	
Continent of origin	**67**		**65**		
European	56	83.6%	47	72.3%	0.143
Non-European	11	16.4%	18	27.7%	
Employment	**67**		**65**		
Full-time work	16	23.9%	18	27.7%	
Part-time work	7	10.4%	3	4.6%	0.394
Unemployed	2	3.0%	5	7.7%	
Student	42	62.7%	39	60.0%	
Childhood pet ownership	**67**		**65**		
Yes	54	80.6%	53	81.5%	1.000
No	13	19.4%	12	18.5%	
	Control Group 2		**Environmental impact treatment (T2)**		**Mann-Whitney U**
Continuous variables	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**P > |z|**
Meat consumption score	67	5.8 (2)	68	6.5 (2.3)	0.141
Meat attachment score	67	19.5 (4.6)	68	20.7 (4.4)	0.132
Age	67	24.7 (7)	68	24.5 (6.7)	0.665
Categorical variables	**N**	**Proportion**	**N**	**Proportion**	**Fisher's Exact**
Gender	**67**		**68**		
Female	33	49.3%	33	48.5%	1.000
Male	34	50.7%	35	51.5%	
Education	**67**		**68**		
Less than bachelor's degree	14	20.9%	12	17.6%	
Bachelor's degree	31	46.3%	36	52.9%	0.764
More than bachelor's degree	22	32.8%	20	29.4%	
Continent of origin	**67**		**68**		
European	50	74.6%	50	73.5%	1.000
Non-European	17	25.4%	18	26.5%	
Employment	**67**		**68**		
Full-time work	16	23.9%	14	20.6%	
Part-time work	7	10.4%	10	14.7%	0.220
Unemployed	1	1.5%	6	8.8%	
Student	43	64.2%	38	55.9%	
Childhood pet ownership	**67**		**68**		
Yes	46	68.7%	53	77.9%	0.247
No	21	31.3%	15	22.1%	

Appendix 4.6 – Histograms of MEJ and EIS residuals and Jarque-Bera test for normality of residuals conditional on regressors.

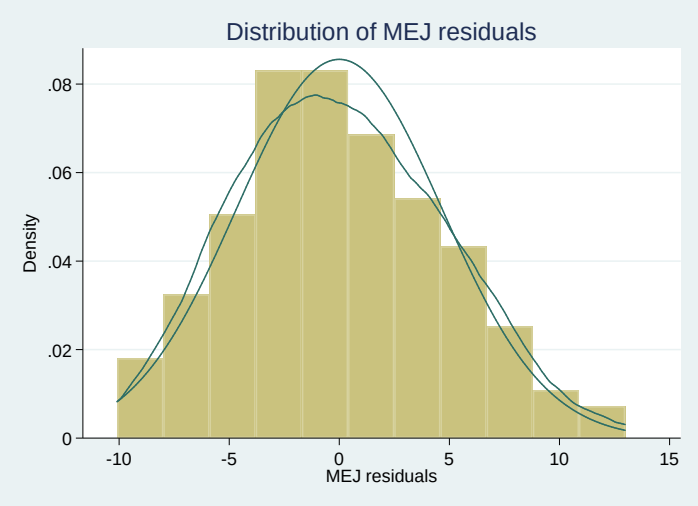

Figure A4.3: Distribution of MEJ residuals calculated based on Model 3

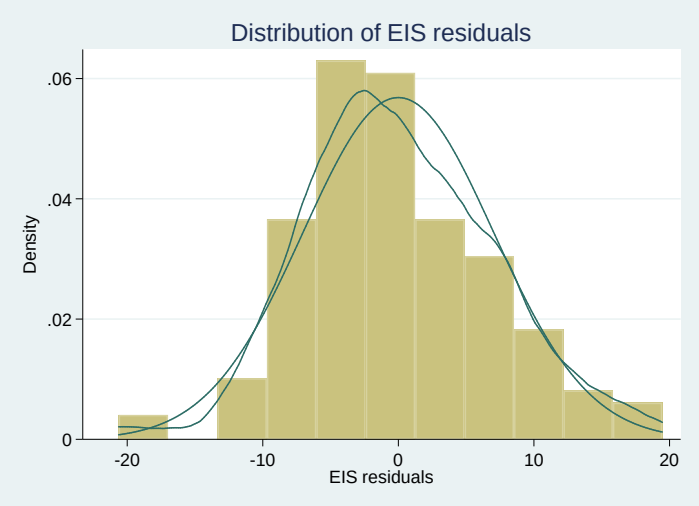

Figure A4.4: Distribution of EIS residuals calculated based on Model 6

Table A4.5. Jarque-Bera test for normality of the MEJ and EIS residuals conditional on the regressors

Dependent variable	**N**	**Chi-Squared**	**p-value**
MEJ score	132	1.86	0.395
EIS score	135	0.99	0.610

Notes: H_0: Residuals are normally distributed. Residuals are calculated from Models 3 and 6

Appendix 4.7 – Joint significance test for the demographic variables in Model 3.

Table A4.6. Joint significance test of demographics in Model 3

Variables	
Age	
Europe	
Education	
Male	
Employment	
F	1.86
Prob > F	0.1066

Notes: H_0: The demographic variables are not jointly significant.

Appendix 4.8 – Power calculations for the main MWU analyses.

Table A4.7. Power calculation for the main MWU analysis.

Treatment	**Sample size**	**Alpha**	**Effect size d**	**Power (1 - β)**
Control Group 1	67	0.10	0.019	0.102
Animal welfare treatment (T1)	65			
Control Group 2	67	0.10	0.067	0.124
Environmental impact treatment (T2)	68			

*Notes: The power calculations were performed using the software G*Power.*