Convincing Conversations:
Using hypothetical versus non-hypothetical disengagement belief handling in a MI-based dialogue system for promoting a protein transition

Master’s thesis Health communication
University of Groningen, The Netherlands
31-8-2017

Author: Marleen E. Buizer
Student number: 2401959
Address: Turfsingel 60
9711 VV Groningen
The Netherlands
Telephone: +316 2789 0698
E-mail: M.e.buizer@student.rug.nl

First assessor: Prof. dr. J.C.J. Hoeks
Second assessor: G.J. Mills, PhD
Abstract

The consumption of animal proteins has been associated with severe negative influences on health, the environment, and animal welfare. The aim of this study was to examine whether handling disengagement beliefs by providing non-hypothetical, evidence-based counterargumentation would lead to a bigger effect in the intention of omnivores to reduce their consumption of animal proteins than giving hypothetical, or what-if counterargumentation. A computer-delivered dialogue system was designed. The system applied theoretical insights from Motivational Interviewing and the Social Determination Theory. 159 respondents were randomly assigned to one of three versions of the intervention: two experimental conditions and one control group condition. The study had a pretest-posttest control group design. Analysis of the results revealed that hypothetical disengagement belief handling appeared to lead to a higher behavioural intention than non-hypothetical disengagement belief handling.

Keywords: Dialogue system; motivational interviewing; persuasive communication; disengagement belief handling; plant-based nutrition.
Index

1. Introduction ......................................................................................................................... 6
2. Theoretical background ........................................................................................................ 6
   2.1 Knowledge ....................................................................................................................... 7
   2.2 Cognitive dissonance ....................................................................................................... 7
   2.3 Rationalizing meat consumption ..................................................................................... 8
   2.4 Elaboration likelihood model ........................................................................................ 10
   2.5 Tailoring ........................................................................................................................ 11
   2.6 Motivational interviewing .............................................................................................. 11
   2.7 Self Determination Theory ............................................................................................. 13
   2.8 Research questions ........................................................................................................ 14
     2.7.1 Alternative hypotheses ............................................................................................ 14
3. Methodology ........................................................................................................................ 15
   3.1 Respondents .................................................................................................................. 15
   3.2 Materials ....................................................................................................................... 16
   3.3 Method .......................................................................................................................... 17
     3.3.1 General module ......................................................................................................... 18
     3.3.2 Tailoring module ....................................................................................................... 21
     3.3.3 Behavioural module .................................................................................................. 23
   3.4 Procedure ...................................................................................................................... 25
   3.5 Analysis .......................................................................................................................... 25
4. Results .................................................................................................................................. 26
   4.1 General findings ............................................................................................................. 26
     4.1.1 Avatar choice ............................................................................................................ 26
     4.1.2 Denial of permission ............................................................................................... 26
     4.1.3 Value domain endorsement .................................................................................... 27
     4.1.4 Disengagement belief endorsement ......................................................................... 28
     4.1.5 Willingness to change ............................................................................................ 29
     4.1.6 Dropout rates .......................................................................................................... 29
   4.2 Attitude ......................................................................................................................... 29
   4.3 Motivation ...................................................................................................................... 29
   4.4 Self-efficacy ................................................................................................................... 30
   4.5 Intention ......................................................................................................................... 30
     4.5.1 Effects of intervention exposure on Intention ............................................................ 31
     4.5.2 Effects of Condition on Intention .......................................................................... 32
     4.5.3 Effects of Sex on Intention ..................................................................................... 33
     4.5.4 Effects of DBH on Intention .................................................................................. 33
   4.6 Evaluation variables ....................................................................................................... 33
     4.6.1 Effects of Condition on Evaluation variables .......................................................... 33
     4.6.2 Effects of Sex on Evaluation variables .................................................................... 33
     4.6.3 Effects of DBH on Evaluation variables ................................................................. 33
     4.6.4 Effects of Avatar on Evaluation variables ............................................................... 34
5. Conclusion ............................................................................................................................ 34
6. Discussion .............................................................................................................................. 35
   6.1 Experimental design ....................................................................................................... 36
   6.2 Intervention duration ...................................................................................................... 36
   6.3 Heuristic principles ....................................................................................................... 37
For readability considerations, the author has chosen to use only male personal pronouns (e.g. 'he', 'him', 'his'), for example when discussing a respondent. In this case, these terms refer to both men and women.
1. Introduction

The global demand for meat, dairy, and eggs is rising rapidly. This is caused by a number of global developments, including overall economic progress in developing countries, and the growing world population. However, an increasing number of national and international researchers state that the human demand for animal proteins is creating an untenable situation. The production and consumption of meat and other animal products has been linked with a strong negative impact on three domains: the environment, animal welfare, and our health.

First, animal nutrition has a relatively high negative impact on the environment, compared to plant-based nutrition. According to the Food and Agriculture Organisation (FAO) of the United Nations (UN) livestock accounts for 18% of global greenhouse gas emissions (measured in CO₂ equivalent; Steinfeld, H., Food and Agriculture Organization of the United Nations, & Livestock, Environment and Development, 2006: p.xxi). This is more than the entire transport sector. Livestock is also responsible for a substantial share of other, more harmful, anthropogenic greenhouse gases, such as methane, nitrous oxide, and ammonia (Steinfeld et al., 2006: p.xxi). Furthermore, the agricultural industry uses substantial amounts of fresh water and land. It thereby contributes to water pollution, land degradation, and loss of biodiversity.

Second, the production of meat, dairy, and eggs is associated with violations of animal welfare. Animals in the agricultural industry are being raised in circumstances that have been proven to harm their physical and mental well-being. Furthermore, every day millions of animals are being killed in every type of livestock farming. For example, male chickens and cows are being killed, since they cannot contribute to the production of eggs and dairy. Other animals are killed because of their meat.

Third, the (over)consumption of meat, eggs, and dairy has been linked with various health risks. Many Western consumers tend to exceed the dietary recommendations for the intake of saturated fats, due to the high share of animal products in their diet (Westhoek, Lesschen, Rood, Wagner, De Marco, Murphy-Bokern, [...] & Oenema, 2014). A protein transition could reduce the risk of various diseases, including cardiovascular diseases (Westhoek et al., 2014), type 2 diabetes (Aune, Ursin & Veierød, 2009), and obesity (Rouhani, Salehi-Abargouei, Surkan & Azadbakht, 2014).

A shift towards a more plant-based diet (also referred to as a ‘protein transition’) could therefore have many positive consequences for both humans, animals, and the environment. Because of this, a protein transition is recommended by a growing body of (inter)national research institutes and public organisations. Among these institutions are the UN (Hertwich, Van der Voet, Suh, & Tukker, 2010), the Dutch National Institute for Public Health and the Environment (RIVM; Ocké, Toxopeus, Geurts, Mengelers, Temme & Hoeymans, 2017) and the Dutch Environmental Assessment Agency (PBL; Westhoek et al., 2014).

One technique for persuading people to make this behavioural change, is by means of a conversation. Conversations have been proven to be an effective method for persuading people to change their behaviour, for example in the field of safe sex behaviour (Helme, Noar, Allard, Zimmerman, Palmgreen & McClanahan, 2011). In the following paper, a study investigating the effects of a computer-delivered MI-based dialogue system (aimed at persuading people to switch to a more plant-based diet) is discussed. In the following section, I will provide some background information on this subject.

2. Theoretical background

A more plant-based lifestyle is still a relatively rare phenomenon in the Netherlands. It is estimated that 3 to 4.5% of the population maintains a vegetarian lifestyle. (Natuur en Milieu,
2015: p.3; Dagevos, Voordouw, Van Hoeven, Van der Weele & De Bakker, 2012: p.9). Approximately less than a half percent of the Dutch citizens adheres to a vegan lifestyle (Schyns, 2016: p.52). On the other hand, flexitarianism, a lifestyle in which people sometimes eat vegetarian, appears to have become a more common phenomenon in many households. However, numbers on this lifestyle diverge strongly. According to research carried out by the Netherlands Nutrition Centre (Voedingscentrum) 55% of the Dutch population does not eat meat during dinner for at least three days per week (Keuchenius & Van der Lelij, 2015: p.42), whereas according to Dagevos et al. (2012: p.42) only 42.5% of the population belongs to this group.

2.1 Knowledge
According to a study by Keuchenius & Van der Lelij (2015: p.8) one in three Dutch people intends to switch to a more environmentally friendly food consumption pattern in the future. Four in ten people are motivated to eat healthier in the future. With regards to a protein transition these results seem promising. But this raises the question why not more people are already decreasing the amount of animal proteins in their diet. One possible explanation for the persistent low share of flexitarians, vegetarians, and vegans could be a lack of knowledge. A number of studies suggest that many consumers in Western countries are unaware of the harmful consequences of a diet with a high amount of animal proteins.

For example, awareness on the ecological impact of meat production appeared to be relatively low among Australian consumers (Lea & Worsley, 2005). The researchers asked Australian consumers to rank a number of pro-environmental behaviours, based on their environmental benefits. The resulting top three consisted of ‘using less packaging’, ‘composting household food scraps’, and ‘buying food that has been grown locally’. Reducing meat consumption was perceived to be least environmentally beneficial.

In reality, the opposite is true. Based on life cycle assessment (LCA; a study examining the environmental impact of a product throughout its lifecycle) meat consumption is one of the most polluting food consumption activities, whilst reducing packaging has a relatively minor impact in this matter (Jungbluth, Tietje & Scholz, 2000). Tobler, Visschers & Siegrist (2011) found a similar belief pattern among Swiss consumers. Because of this similarity, they consider it “conceivable that these results are generalizable to other developed countries” (2011: p.679).

According to both Lea & Worsley (2005) and Tobler et al. (2011) there was a moderate consistency between knowledge and behaviour. The more a respondent believed a certain behaviour was beneficial in some way, the more likely he was to perform this behaviour. The authors therefore indicate that it might be worthwhile to raise public consciousness by means of informational campaigns.

Tobler et al. (2011) also found differences in the motives their subpopulations had for reducing their meat consumption. They therefore recommend taking these various motives into account when designing an informational campaign. For example, younger people might generally be more motivated to reduce their meat consumption out of environmental considerations, whereas older people might be more motivated by health concerns.

Health and the environment, along with a concern for animal welfare, are among the most common motivations to convert to a more plant-based diet (Rozin, Markwith, & Stoess, 1997; Fox & Ward, 2008a; Fox & Ward 2008b; Ruby, 2012; Hoffman, Stallings, Bessinger & Brooks, 2013; Rothgerber, 2015; Jabs, Devine & Sobal, 1998). In the present study, the three subjects will be referred to as value domains (VDs).

2.2 Cognitive dissonance
If an individual is provided new information that is incompatible with his current behaviour he might experience cognitive dissonance (Festinger, 1962; Mills, Harmon-Jones & American Psychological Association, 1999). This term refers to an aversive state, resulting from a difference between a person's cognitions and his behaviour. A cognition is “any belief, opinion,
attitude, or piece of knowledge about anything—about other persons, objects, issues, oneself, and so on” (O’Keefe, 2002: p.78). In order to minimize the “gap” between behaviour and cognition, a person may want to adapt either one of the two components.

For omnivores, cognitive dissonance is sometimes referred to as a ‘meat paradox’ (Loughnan, Haslam & Bastian, 2010: p.156): the omnivore eats meat, but at the same time he is aware of the negative consequences of his lifestyle. When confronted with a dissonant cognition the omnivore might therefore respond in two ways. He can attempt to resolve the resulting moral conflict by replacing meat with a non-animal alternative (behavioural change), or by justifying or ratifying his current behaviour (cognitive change).

**Disengagement beliefs** (DBs) are counterarguments that can help a person deal with dissonant cognitions (Dijkstra, 2009; Kleinjans, Van den Eijnden & Engels, 2009). They deal with information that conflicts with a person’s current behaviour by either reducing the importance of the dissonant cognition, increasing the importance of the consonant cognition, removing the dissonant cognition or by adding new consonant cognitions (Mills et al., 1999).

DBs may be true in themselves, but they do not always provide valid reasons for certain behaviours (Dijkstra, 2009). The individual may not always be aware of this lack of validity. For example, an omnivore might dismiss ecological arguments to eat vegetarian by stating that during the production of soy—an ingredient widely used in meat substitutes—harmful pesticides are used. This justification may be true in itself, but it dismisses the fact that most soy is produced as food for livestock (WWF, 2014). Eating meat therefore does not mean that the omnivore is not indirectly involved in the production of soy. In this example the omnivore’s belief serves as a way to disengage from the idea that it would be better to eat more plant-based food.

Dijkstra (2009) has investigated the effects of DBs on persuasive communication in the field of smoking cessation. He hypothesized that responding to disengagement beliefs with more valid persuasive information could break down the “barrier” created by these beliefs. Responding to DBs with counterargumentation is also referred to as **disengagement belief handling** (DBH). Smokers who strongly adhered to DBs displayed relatively low spontaneous quitting activity, in comparison with people with low DB-adherence (DBA). However, exposure to persuasive information increased this quitting activity in the high DBA-group. Conversely, the same information had less effect among those smokers who already displayed low DBA-scores and high spontaneous quitting activity. These findings support the notion that it is worthwhile to take these DBs into account when designing an informational campaign.

### 2.3 Rationalizing meat consumption

There are many justifications to make eating meat more psychologically tolerable, whenever this type of behaviour is scrutinized or criticized. These justifications can therefore be seen as a type of disengagement beliefs. Recently, two studies have attempted to create comprehensive classification systems for the different types of rationalization strategies that omnivores engage in.

The first classification system is Rothgerber’s (2012) meat-eating justification (MEJ; Table 1) scale. Rothgerber wanted to test whether or not men embraced different ratification techniques for their meat consumption behaviour than women. He therefore developed the MEJ-system, a scale that categorizes the direct and indirect strategies people use for justifying their omnivorous diet. The subscales are based on the results from interviews with vegetarians and non-vegetarians, a review of the literature on vegetarianism, and brainstorming and critique by Rothgerber’s research team. He found a positive correlation between MEJ-endorsement and the consumed amount of meat.

Piazza, Ruby, Loughnan, Luong, Kulik, Watkins, & Seigerman (2015) have also established their own system for categorizing meat-eating justifications. They requested two samples of respondents ($N_1=188$, $N_2=107$) to individually give three spontaneous justifications for eating meat. Their responses were coded. The resulting classification is referred to as ‘the
<table>
<thead>
<tr>
<th>MEJ-subscale</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td></td>
</tr>
<tr>
<td>Pro-meat</td>
<td>“I enjoy eating meat too much to ever give it up.”</td>
</tr>
<tr>
<td>Denial</td>
<td>“Animals don’t really suffer when being raised and killed for meat.”</td>
</tr>
<tr>
<td>Hierarchical justification</td>
<td>“It’s acceptable to eat certain animals because they are bred for that purpose.”</td>
</tr>
<tr>
<td>Dichotomization</td>
<td>“To me, there is a real difference between animals we keep as pets and animals we eat as food.”</td>
</tr>
<tr>
<td>Religious justification</td>
<td>“God intended for us to eat animals.”</td>
</tr>
<tr>
<td>Human destiny/ fate</td>
<td>“It violates human destiny to give up eating meat.”</td>
</tr>
<tr>
<td>justifications</td>
<td></td>
</tr>
<tr>
<td>Health justification</td>
<td>“We need meat for a healthy diet.”</td>
</tr>
<tr>
<td>Indirect</td>
<td></td>
</tr>
<tr>
<td>Dissociation</td>
<td>“When I look at meat, I try hard not to connect it with an animal.”</td>
</tr>
<tr>
<td>Avoidance</td>
<td>“I try not to think of what goes on in slaughterhouses.”</td>
</tr>
</tbody>
</table>

Table 1: MEJ-strategies and scale items (Rothgerber, 2012: p.13).

<table>
<thead>
<tr>
<th>4N categories</th>
<th>4N Disengagement beliefs</th>
</tr>
</thead>
</table>
| Natural        | • It is only natural to eat meat.  
                | • It is unnatural to have an all plant-based diet.  
                | • Our human ancestors ate meat all the time.  
                | • Human beings naturally crave meat.                                                             |
| Necessary      | • It is necessary to eat meat in order to be healthy.  
                | • You cannot get all the protein, vitamins, and minerals you need on all plant-based diet.     |
                | • Human beings need to eat meat.  
                | • A healthy diet requires at least some meat.                                                   |
| Normal         | • Not eating meat is socially unacceptable.  
                | • It is abnormal for humans not to eat meat.  
                | • Most people I know eat meat.  
                | • It is normal to eat meat.                                                                     |
| Nice           | • Meat is delicious  
                | • Meat adds so much flavour to a meal it does not make sense to leave it out.              |
                | • The best tasting food is normally a meat based dish (e.g. steak, chicken filet, bacon).  
                | • Meals without meat would just be bland and boring.                                          |

Table 2: The 4N-categories and their corresponding items/ disengagement beliefs (Piazza et al., 2015: p.124).
Four Ns of justification’ (Table 2). The authors suppose argumentation can be classified as either ‘Normal’ (appeals to expectations from society), ‘Natural’ (appeals to the naturalness of eating meat, biology, natural selection, et cetera), ‘Necessary’ (appeals to the necessity of meat for survival and good health), or ‘Nice’ (appeals to the pleasure derived from meat consumption).

According to the authors 4N-justifications accounted for 83% of 514 responses from the first population sample, and for 91% of the 321 responses from the second sample (Piazza et al., 2015: 117). The majority of principal meat consumption justifications therefore appears to be comprised by this model. Arguments that did not fit within the 4N-classification appealed to for example humane slaughtering methods, religion, sustainability, and other, miscellaneous arguments.

Piazza et al. (2015) also explored the relationship between their own 4N-scale and Rothgerber’s (2012) MEJ-scale. Both scales contain overlapping justification categories. For example, MEJ’s Hierarchical justifications-category overlaps with the Natural-category in the 4N-classification, and MEJ’s Pro-meat subscale bears strong resemblance to 4N’s Nice-category. Analysis revealed a moderate to high correlation of the 4N-items with all direct MEJ-subscases. However, it did not correlate with either of the indirect subscales.

However, according to Piazza et al. (2015: p.126), the 4N-scheme has a number of advantages over the MEJ-scale. First of all, justifications that resemble the Normal-category are largely absent from the MEJ-scale. Secondly, the factor structure of the 4N-scale is more internally coherent, because it only measures direct strategies. Piazza et al. claim that, as a result, their classification is more suitable for researchers whose focus is on rationalizing meat-eating. The intervention in the present study was based on the type of DBs people use for justifying their meat consumption. For that reason, the researcher of the present study has chosen to use the 4N-scale items as a starting point for the intervention.

2.4 Elaboration likelihood model
Traditional informational campaigns usually take a relatively standardized, one-size-fits-all approach. However, if the given information is not relevant to an individual, he might not put substantial effort into processing the information. Adapting information to an individual’s personal values and beliefs might therefore be worthwhile. According to the Elaboration Likelihood Model (ELM; Petty, Briñol & Priester, 2009; Petty & Cacioppo, 1986) the depth of processing a persuasive message is influenced by the recipient’s motivation to process. This motivation is influenced by several factors, such as urgency, the individual’s need for cognition and the personal relevance of the information in the message.

Based on the height of his motivation to process the persuasive information, a person might take one of two routes: a central route or a peripheral route. If the recipient’s motivation to process is high, the individual will process the given information through the central route. The content is carefully scrutinized, thereby drawing on prior knowledge and experience. The resulting attitude shift is “relatively enduring, resistant to counterpersuasion, and predictive of behaviour” (Petty, Briñol & Priester 2009: p.133). The peripheral route is the opposite of the central route: in this route information is not thoroughly processed. Persuasion is influenced by relatively simple cues, such as heuristics, liking, and identification with the source. The following attitude change is “relatively temporary, susceptible to counterpersuasion, and unpredictable of behaviour” (Petty, Briñol & Priester, 2009: p.133).

The ELM might therefore explain why traditional mass media awareness campaigns could potentially be less successful in persuading people to eat less meat. Because of the standardized approach of this traditional campaigns, information does not always match the individual’s prior knowledge, behavioural patterns, beliefs, and interests. The resulting lack of personal relevance may lead to receivers processing the information through the peripheral route. However, the main goal of persuasive campaigns is to stimulate an enduring behavioural
shift. The makers will therefore probably aim at having receivers process the given information through the central route.

2.5 Tailoring
An important technique for stimulating central processing is to increase the message’s relevance. With current technological developments, it is already possible to personalize the content of a text, based on a pre-assessment of an individual’s cognitions. The relevance of the information to the receiver is increased through this, which could result in a heightened chance of persuasion (Kreuter & Wray, 2003). This phenomenon, known as tailoring, is a common practice in persuasive health communication. Tailoring is “a multidimensional communication strategy that involves developing individualized messages based on key individual-difference variables or characteristics linked to an underlying model of behaviour change” (Lustria, Noar, Cortese, Van Stee, Glueckauf & Lee, 2013: p.1040).

According to several meta-analyses in the field of printed (Noar, Benac & Harris, 2007) and computer-delivered, tailored interventions (Krebs, Prochaska & Rossi, 2010; Lustria et al., 2013; Portnoy, Scott-Sheldon, Johnson & Carey, 2008; Sohl & Moyer, 2007) tailored messages have a significantly larger effect on behavioural intention than non-tailored messages. Tailored messages are also more likely to be read and remembered, and to be discussed with others (Skinner, Campbell, Rimer, Curry & Prochaska, 1999).

So far, the technique has predominantly been used in persuasive health communication, for example to promote mammography screenings, physical exercise, or smoking cessation. However, Pelletier & Sharp (2008) advocate using the technique for encouraging pro-environmental behaviour (PEB) as well. The authors also suggest that -in order to stimulate PEB- it would be useful to frame messages in terms of intrinsic goals (e.g. health, social status), instead of extrinsic goals (e.g. money, comfort). According to Vansteenkiste, Lens, & Deci (2006) intrinsic goal framing, relative to extrinsic goal framing, results in deeper processing of the persuasive information related to the desired behaviour.

Perhaps tailoring could also be used as a tool for promoting a transition to a more plant-based consumption pattern. Especially since there is a large variability among key determinants of the behavioural change in this matter (Kreuter & Wray, 2003). One individual might be more sensitive for arguments that emphasize health benefits, whereas someone else is persuaded more easily by animal welfare arguments. By pre-assessing individuals, it can be decided to what extent their cognitions match these different themes and arguments.

2.6 Motivational interviewing
The present study is part of the Convincing Conversations (CoCo)-project of the University of Groningen. This project is aimed at researching how people can be convinced to reduce the share of animal nutrition products in their diet by means of a conversation. Several CoCo-studies have already investigated the persuasive effect of tailoring through the use of a digital dialogue system (Hagen, 2016; Van Styrum, 2017; Zaal, Mills, Hagen, Huiskes & Hoks, 2017).

Computer-delivered tailored interventions, such as dialogue systems, have several benefits. First of all, they are a relatively cost-effective communication channel, compared to their mass media dissemination potential. Secondly, they offer the possibility to interact with receivers. Interventions can use this possibility to assess an individual’s cognitions and to adapt the information exchange in real-time, based on this assessment. Interaction can also stimulate the receiver’s engagement with the intervention, because it requires him to actively participate. And finally, in digital dialogue systems dialogue variables (e.g. phonetic variables, conversational flow) can easily be controlled and held constant. This is especially convenient from a research perspective. The number of variables that could potentially moderate the study results (e.g. “counsellor variables”) can be reduced to a minimum.
However, a downside of digital tailored interventions is that some relevant information could be “overlooked”, due to the closed-ended nature of digital assessments. Previous versions of CoCo-interventions have asked closed questions, in the form of multiple choice questions. Closed questions offer receivers a relatively limited freedom of choice. A person could feel frustrated after finding out that his preferred answer is not among the answer options. 

Motivational interviewing (MI: Miller & Rollnick, 2013) was based on the selected DB. Disengagement belief handling can therefore be seen as a form of tailoring. The respondent was asked whether he would be open to a dietary change if the selected DB would not be applicable. For example, a respondent who thought having a plant-based diet was more expensive than his current lifestyle was asked what he would do if it would not be more expensive. By stimulating hypothetical reasoning respondents were encouraged to reconsider the validity of their arguments.

Subsequently, the intervention gave hypothetical counterargumentation for the selected DBs in the form of what-if questions. The counterargumentation in this intervention was based on the selected DB. Disengagement belief handling can therefore be seen as a form of tailoring. The respondent was asked whether he would be open to a dietary change if the selected DB would not be applicable. For example, a respondent who thought having a plant-based diet was more expensive than his current lifestyle was asked what he would do if it would not be more expensive. By stimulating hypothetical reasoning respondents were encouraged to reconsider the validity of their arguments.

Motivational interviewing is: (...) a collaborative, goal-oriented style of communication with particular attention to the language of change, designed to strengthen personal motivation for and commitment to a specific goal by eliciting and exploring the person’s own reasons for change within an atmosphere of acceptance and compassion. (Miller & Rollnick, 2013: p.410)

The style was originally used by counsellors who wanted to help their clients deal with addiction behaviours.

A central notion in the concept of MI is that motivation should not be imposed from outside, but elicited from within a person. The counselling style has already proven to be effective in various therapeutic healthcare settings, such as addiction treatments (Burke, Arkowitz & Menchola, 2003; Rubak, Sandbaek, Lauritzen & Christensen, 2005). However, to the author’s knowledge, the CoCo-studies are the first ones that apply MI to stimulate pro-environmental behaviour.

The “spirit of MI” is reflected by four elements: partnership, acceptance, evocation, and collaboration (Miller & Rollnick, 2013). Partnership means that MI is an active collaboration between experts. The client is the expert on himself, and the interviewer helps the client to find his own motivation to change. The counsellor needs to accept the client’s input, regardless of his personal opinions. Evocation involves helping the client find whatever he needs to change from within himself. Being compassionate is being able to give priority to the other person’s needs.

The flow of MI-conversations is comprised of four processes: engaging, focusing, evoking, and planning (Miller & Rollnick, 2013). The processes can best be represented as a staircase: each process follows the next one, but also builds up on the previous step. The first level/step is engaging. During engaging both conversational partners provide the foundation for their working relationship. Focusing involves developing and maintaining a direction for the conversation about change. The next step, evoking, is at the heart of MI: the client’s own motivation for change is elicited. Finally, a plan is made for the change. Ultimately, the goal of the counsellor is to have the client elicit change talk: the client acknowledges the need for
change and expresses his intention to change or the belief that change is possible. These four processes served as a framework for the intervention designed for this study.

As mentioned before, a downside of digital tailored interventions used in the CoCo-project is that the closed-ended nature of the questions might compromise the information exchange to some extent. Ideally, MI is “like a waltz”: the practitioner asks an open question and reflects to what the person says (Miller & Rollnick, 2013: p.63). This reflective listening is a fundamental skill to master the conversational technique. Miller & Rollnick argue that multiple choice questions are actually closed questions that are masked as open ones.

Computer-delivered MI-interventions do not fully capture the spirit of motivational interviewing, since they are unable of interpreting answers to open questions. Instead, they usually use closed questions, which only enable the conversational partner to respond with short answers or specific information. In the present study, elements of MI (such as using autonomy-supportive language, eliciting change talk, and the overall conversation structure) are used to partially replicate the method in a digital intervention. Because of this, the author therefore argues to refer to the intervention as “MI-based”.

2.7 Self Determination Theory

The Self Determination Theory (SDT; Ryan & Deci, 2000) can provide a framework for understanding certain psychological processes underlying MI. According to this theory all types of behaviour are positioned somewhere along a continuum of motivation, varying in their degree of self-determination (i.e. how much the motivation for this behaviour originates from within the individual). The continuum ranges from controlled motivation to autonomous motivation. Controlled motivation includes introjected regulation (aimed at avoidance of negative emotions, or at enhancing one’s ego) and external regulation (motivated by the prospect of rewards or guilt). Autonomous motivation consists of intrinsic motivation (motivated by enjoyment or satisfaction) and identified regulation (motivated by the prospect of personally valued outcomes).

Both types of motivation have different outcomes. Controlled motivation leads to behaviour that only occurs when the external motivation is present. Autonomously regulated behaviour is associated with more positive experiences, greater stability, and greater care in performing the behaviour. This is the type of motivation which MI-counsellors and -interventions usually strive for.

The SDT posits that there are three fundamental psychological needs that serve as a basis for autonomous motivation: a need for competence, a need for autonomy, and a need for relatedness. The first component, the need for competence, refers to the human need to master certain abilities and to have confidence in one’s own capacity to control the outcomes of the behaviour. The second factor, need for autonomy, involves the desire to feel autonomous in one’s actions, rather than being controlled. The third need, the need for relatedness, concerns the need to feel connected with others and to have satisfying social relationships.

An individual’s social environment can help facilitate self-determined motivation by providing a context which supports these needs. Both Markland, Ryan, Tobin & Rollnick (2005) and Vansteenkiste & Sheldon (2006) propose that there are various parallels between the social-environmental factors that underlie self-determination and MI-principles and strategies.

According to Markland et al. (2005) the need for competence can be accommodated in MI “by the provision of clear information about behaviour-outcome contingencies, by helping the client to embrace realistic expectations and to set appropriate self-selected goals, and by giving positive, non-judgmental feedback” (p.822). Autonomy is facilitated “by avoiding confrontation and coercion, by exploring behavioural options, by developing the discrepancy between the client’s current behaviour and how they would like to be, so that they present the arguments for change themselves, and by encouraging clients to choose their preferred course of action” (Markland et al, 2005: p.822). Finally, the need for relatedness can be promoted by
“the expression of empathy and noncontingent support, and by the avoidance of criticism or blame” (Markland et al., 2005: p.822).

Friederichs, Oenema, Bolman, Guyaux, Van Keulen & Lechner (2014) have described how they incorporated theoretical insights from the SDT and MI in a web-based tailored intervention, aimed at stimulating physical activity. Their intervention, along with earlier versions of CoCo-interventions, served as an inspiration for the intervention designed for the present study.

2.8 Research questions
One possible downside of Hagen’s (2016) what-if strategy for counterargumentation/DBH is that respondents could perceive it as unrealistic if they lack knowledge. This form of argumentation linguistically implies a hypothetical connection to the disengagement belief, even if the presented situation could be factually substantiated. Respondents may not, or may be less capable to perform this type of hypothetical reasoning if they are not aware of the lack of validity of their DB. Secondly, people who are unfamiliar with the disadvantages of eating high amounts of animal protein might not experience ambivalence towards the desired behaviour. They might therefore also lack motivation to change. Providing information to increase their knowledge level might be a more suitable strategy for them.

For that reason, the main goal of this study was to examine whether handling disengagement beliefs with evidence-based (non-hypothetical) counterargumentation would lead to a bigger effect in the intention of omnivores to reduce their consumption of animal nutrition products than giving what-if counterargumentation. In order to answer this question, two experimental versions with different types of DBH (‘hypothetical’ and evidence-based, or ‘non-hypothetical’ DBH), and a control group version of a MI-based dialogue system were created. In this control group DBs were not handled.

2.7.1 Alternative hypotheses
In addition to the main research question, a number of explorative hypotheses were tested. First of all, it was assessed whether a DB-tailored intervention would be more effective in increasing people’s intention to reduce their consumption of animal products than a non-DB tailored (control group) intervention. Noar et al. (2007) state that tailored interventions with a higher number of tailored-on concepts have a bigger behavioural effect. This may be due to the increased personal relevance of the message. Furthermore, Dijkstra (2009) found that adherence to DBs is a relevant individual variable to consider during tailoring. Perhaps matching information to specific (disengagement) beliefs, in addition to personalizing on value domains, would be more effective than tailoring on VDs only. This led to the following hypothesis:

- $H_1$: Interventions which tailor information on specific disengagement beliefs have a bigger effect on behavioural intention than interventions that do not handle these disengagement beliefs.

Secondly, the study investigated the effect of the type of DBH on the participants’ reactance. In the non-hypothetical condition disengagement beliefs are handled by giving counterargumentation in the form of evidence-based information. In the hypothetical condition this DBH has a hypothetical form. However, the form of the non-hypothetical condition runs the risk of undermining people’s sense of autonomy.

MI is a person-centered counselling style. The counsellor must therefore never take on an expert role. In the spirit of MI, the client is the expert on himself. Miller & Rollnick (2013) state that providing information and advice is not forbidden, but that it should be done with caution. Information provision in MI should always meet two conditions: (1) Permission should be asked; (2) Information should only be provided when the counsellor carefully understands the client’s perspective and needs. Ultimately, the client should reach his own conclusions about the relevance of this info.
A strategy for exchanging information during MI is using the elicit-provide-elicit (EPE) approach (Miller & Rollnick, 2013: 139). First, the counsellor should elicit by asking permission to start the exchange. Furthermore, he should explore what kind of information the client needs. Second, during provision the counsellor should prioritize (by giving only information the client needs) and communicate this in a clear way. He should also use autonomy-supportive language and refrain from interpreting the meaning of the conveyed knowledge. Third, the counsellor should elicit again, by asking the client for his interpretation or another form of response.

Information provision is thus a very complex act. If done in the wrong way, a person might feel undermined in his autonomy. This in turn could lead to reactance and counterarguing by the client. The researcher has tried to incorporate the EPE-approach in the non-hypothetical and control group conditions of the intervention. Nevertheless, the potential threat to the participants’ autonomy is still a lot higher than in the hypothetical condition. For this reason, a second alternative hypothesis was tested:

- $H_2$: Participants in the non-hypothetical conditions will display lower perceived autonomy- and higher counterarguing scores than participants in the hypothetical condition.

Finally, the effect of the avatar gender on participants’ basic psychological needs was assessed. Hagen (2016) used a female avatar, Eliza, for her tailored intervention. She found that male participants displayed a significantly bigger change in behavioural intention after exposure to the MI-intervention. This effect was not found for women. However, with Hagen’s intervention design it cannot be determined to which degree the resulting change in behavioural intention was moderated (positively or negatively) by the gender of the avatar.

Both Rothgerber (2012) and Sobal (2005) argue that meat consumption is linked to a motivation to conform to gender expectations. Men may feel like consuming animal flesh is part of being masculine. Rothgerber (2012) therefore hypothesizes that it might be worthwhile to give persuasive attempts to reduce meat consumption a masculine frame. Perhaps the intention change among male participants would have been even bigger if the avatar in Hagen’s (2016) study would have been male as well. Men might feel more related to this male avatar, which in turn could lead to higher self-determined motivation, according to the SDT.

Interestingly, Rothgerber’s hypothesis appears to be confirmed by one of the male respondents in Hagen’s study. He indicated that he felt that the communication style of the intervention was too much targeted at women. The gender of the avatar could have acted as a moderating variable in this participant’s perception of the conversation. Perhaps he would not have perceived the communication style as “too feminine” if he would have thought that he was having a conversation with a male person.

For that reason, the interventions in the current study offered participants a choice between either a male or a female avatar. It was hypothesized that a conversation with a male avatar will improve facilitation of the basic psychological needs for men, whereas women will feel more satisfied after a conversation with a female avatar. The following hypothesis was formulated:

- $H_3$: Same gender conversations will have a more positive effect on participants’ basic psychological needs than mixed gender conversations.

3. Methodology

3.1 Respondents
A total of 308 respondents participated in this study. Participants were randomly assigned to one of three conditions by the intervention program. Only people who were 18 years or older, and who ate meat at least once a week were eligible for participation. Those who did not meet
these criteria were filtered out by the intervention during the measurement of demographic variables. Afterwards, participants who did not complete the full questionnaire (N=135) and people who did not give permission for the conversation (N=14) were excluded from further analysis.

After removing them, 159 responses were included in the final analysis (N_hyp =43, N_non-hyp =52, N_control =64). Mean age was 35.4 (SD=17.2), ranging from 18 to 83. Educational level was classified according to the definitions by Statistics Netherlands (CBS, 2017). In this paper, the terms low-, medium-, and high educational level respectively refer to the Dutch terms “laagopgeleid”, “middelbaar opgeleid”, and “hoogopgeleid”.

It appears that certain demographic groups were overrepresented in this sample (Table 3). Substantially more women than men took part, and educational level was relatively high. This may be due to the sampling method (described in paragraph 3.4). Also note that the distribution of demographic groups differed substantially from Hagen’s research sample. In the sample of the present study the age category 18-25 accounted for 44 % of the total group, whereas in Hagen’s study almost 75 % of people belonged to this age category. Furthermore, Hagen’s respondents’ age ranged from 17 to 65. In the present study, this range was much broader (minimum= 18 years; maximum= 83 years). These differences should be taken into account when comparing the study results.

<table>
<thead>
<tr>
<th>Hypothetical</th>
<th>Non-Hypothetical</th>
<th>Control group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>14 32,6%</td>
<td>29 67,4%</td>
<td>43 67,2%</td>
</tr>
<tr>
<td>Male</td>
<td>25 48,1%</td>
<td>21 32,8%</td>
<td>60 37,7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age category</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 - 25</td>
<td>15</td>
<td>34,9%</td>
<td>23</td>
<td>44,2%</td>
<td>32</td>
<td>50%</td>
<td>70</td>
<td>44,0%</td>
</tr>
<tr>
<td>26 - 35</td>
<td>10</td>
<td>23,3%</td>
<td>12</td>
<td>23,1%</td>
<td>15</td>
<td>23,4%</td>
<td>37</td>
<td>23,3%</td>
</tr>
<tr>
<td>36 - 45</td>
<td>5</td>
<td>11,6%</td>
<td>4</td>
<td>7,7%</td>
<td>3</td>
<td>4,7%</td>
<td>12</td>
<td>4,7%</td>
</tr>
<tr>
<td>46 - 55</td>
<td>5</td>
<td>11,6%</td>
<td>1</td>
<td>1,9%</td>
<td>6</td>
<td>9,4%</td>
<td>12</td>
<td>9,4%</td>
</tr>
<tr>
<td>56 - 65</td>
<td>4</td>
<td>9,3%</td>
<td>7</td>
<td>13,5%</td>
<td>1</td>
<td>1,6%</td>
<td>12</td>
<td>1,6%</td>
</tr>
<tr>
<td>66+</td>
<td>4</td>
<td>9,3%</td>
<td>5</td>
<td>9,6%</td>
<td>7</td>
<td>10,9%</td>
<td>16</td>
<td>10,9%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Educational level</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2</td>
<td>4,7%</td>
<td>1</td>
<td>1,9%</td>
<td>1</td>
<td>1,6%</td>
<td>4</td>
<td>2,5%</td>
</tr>
<tr>
<td>Medium</td>
<td>12</td>
<td>27,9%</td>
<td>17</td>
<td>32,7%</td>
<td>24</td>
<td>37,5%</td>
<td>53</td>
<td>33,3%</td>
</tr>
<tr>
<td>High</td>
<td>29</td>
<td>67,4%</td>
<td>34</td>
<td>32,1%</td>
<td>39</td>
<td>60,9%</td>
<td>102</td>
<td>64,2%</td>
</tr>
</tbody>
</table>

*) Percentage within condition.

Table 3: Distribution of demographic variables over the three conditions.

3.2 Materials

The current version of the intervention is an adaptation of the Eliza-intervention carried out previously in the CoCo-research project by Hagen (2016) and Zaal et al. (2017). Three versions of a digital dialogue system were devised, using survey-builder Qualtrics: two experimental conditions and one control group condition. The experiment was carried out with a pretest-posttest control group design (Baxter & Babbie, 2004: p. 218).
The independent variables in the three conditions were condition and sex. The dependent variables were avatar, age category, education level, VD-ranking, VD-adherence, DB-ranking, DB-adherence, attitude, motivation to change, self-efficacy, intention, time frame, counterarguing, perceived competence, perceived relatedness and perceived autonomy.

Participants in all three conditions received the same introductory information on a plant-based diet. The experimental manipulations in this study were the type of DBH and the type of VD tailoring (hypothetical versus non-hypothetical; table 4). In the first condition, the hypothetical condition, DBs were handled by asking respondents questions in a what-if format, based on their most important disengagement beliefs. Value domains were also responded to by asking questions in this format. The aim of this what-if strategy was to have respondents reconsider the validity of their DBs. This condition resembles traditional MI more closely than the other conditions, since it asks the participants open questions as a form of counterarguation (Miller & Rollnick, 2013).

The second condition, the non-hypothetical condition, resembled “traditional” tailored informational strategies more closely, since persuasive information was provided. The system responded to the respondent’s most important disengagement beliefs by giving one or two evidence-based counterarguments per DB. Tailored counterargumentation for the most important value domain was also provided, in the form of scientific evidence for the harmful consequences of eating meat and other animal products to the participants’ preferred value domain. For example, when a respondent indicated that he mostly valued health, he received information on the connection between the consumption of animal proteins and various diseases.

The third condition was the control group condition. In this condition the intervention did not respond to the participants’ DBs. By leaving the DBH out it could be verified whether or not a possible change in behavioural intention was caused by either the type of DBH or by the act of disengagement belief handling itself. Counterargumentation for the value domains was identical to the one in the non-hypothetical condition.

### 3.3 Method

All three versions (Appendix A) of the intervention had a virtually similar structure, divided into three modules: a general module, a tailored module, and a behavioural outcome/MI-module (Table 5).

The interventions were pretested by having seven respondents take part in a trial run while thinking out loud (Presser, Couper, Lessler, Martin, Martin, Rothgeb & Singer, 2004: p.4). Afterwards, they were briefly interviewed. Based on their feedback, several questions were rephrased for further clarification. For example, the permission question was formulated more explicitly in terms of giving permission to continue the conversation.

<table>
<thead>
<tr>
<th></th>
<th>Hypothetical</th>
<th>Non-Hypothetical</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Info</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>DBH</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>(hypothetical)</td>
<td>(non-hypothetical)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VD-tailoring</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>(hypothetical)</td>
<td>(non-hypothetical)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(non-hypothetical)</td>
<td>(non-hypothetical)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Info= Information on a plant-based diet; DBH= Disengagement Belief Handling; VD-tailoring= Value Domain Tailoring.

**Table 4: Experimental conditions.**
Five respondents indicated that the duration of the intervention was too long and that it contained too much text. One of them took 27 minutes to complete the questionnaire. Some parts of the intervention were therefore shortened: only the two most important DBs were handled, instead of three. Furthermore, the value domain information for the non-hypothetical and control group condition was reduced from three paragraphs, to only one paragraph. Finally, it was decided to measure dependent variables by using only one or two items.

The information used for handling the disengagement beliefs and for counterarguing the value domains were also fact-checked by a number of experts in the field of environmental science, animal welfare, plant-based nutrition, and clinical epidemiology (Appendix B). This was done to ensure the scientific correctness of the provided information. Based on the expert feedback, a number of adaptations in the content of the information texts were made. I will now discuss the content of the three modules in detail.

3.3 General module
In the intervention participants had a “conversation” with one of two avatars. To reinforce the notion of a “real” conversation, informal speech language was used. The conversation was carried out in Dutch. All quotations in this methodology are therefore translated from Dutch.

3.3.1 Avatar choice
To reduce the possibility of a gender bias in the current intervention, it was decided to incorporate an option to choose between both genders as conversation partners (Image 1A & 1B). Two pictures of young people with relatively similar physical characteristics were selected to fulfil the role of ‘Marc’ and Laura’.

The intervention started off immediately by engaging the respondents in the conversation. This was done by displaying two “avatars”, who introduced themselves. They explained that they wanted to talk with the respondent about his diet: “Hi, we are Marc and Laura. We would like to talk with you about your eating pattern. Which one of us would you prefer to talk to?” The respondents could select whether they wanted to talk with Marc, the male avatar, or with Laura, the female avatar. After this question, the chosen avatar was displayed in every following window. This was done to strengthen participants’ notion of a “real” conversation, thereby stimulating a “working bond” with the avatar. Their avatar choice did not affect the flow, tone, or content of the following “conversation”.

3.3.1.2 Introduction and demographic variables
Next, procedural information on the anonymous nature of the experiment was given: “I’m glad you’ve chosen me! Before we start our conversation, you have to know that all your answers will be treated anonymously. The conversation will take about ten to fifteen minutes. With this questionnaire, you can get a chance to win one of the ten Bol.com gift cards with a value of
ten euros. The win code you can send after answering the questions cannot be linked to your answers!” Afterwards, respondents had to indicate their gender, age and highest completed education. Respondents younger than 18 were excluded from further participation by the intervention.

3.3.1.3 Current behaviour
Respondents then had to give an indication of their current dieting behaviour: “On average, during last month, how many days per week did you maintain the following eating patterns? Please indicate only full days, so including breakfast, lunch and dinner.” For each item they had to fill out a number, ranging from ‘0’ to ‘7’: “At this moment, on average I eat fully plant-based [...] days per week”, “At this moment, on average I eat fully vegetarian [...] days per week”, “At this moment, on average I purposely eat smaller portions of meat than normal [...] days per week”, and “At this moment, on average I eat normal portions of meat [...] days per week”. The total sum of all four item answers had to be ‘7’. Participants who had any special remarks about their diet, such as allergies or religious regulations, could fill those details out in a text box. Those who already had a full vegan or vegetarian eating pattern were excluded from further participation by the intervention.

3.3.1.4 Permission request
Next, the avatar asked the respondents for permission to continue the conversation. In this permission request the focus of the conversation was also further elucidated: “In this program I would like to talk with you about the benefits of a more plant-based eating pattern, so with less meat, fish, or other animal products. It’s important to me that you decide for yourself what you want to talk about and what you don’t. So, what do you think of talking about your diet, and possible changes in it?” Respondents could then choose between “I do give permission to talk about my diet” or “I do not give permission to talk about my diet”. These answer options were chosen after the pretest respondents indicated that they did not recognize a former version of the permission request as such.

Participants who declined the conversation got the following response: “That’s a pity! But of course, I respect your choice!” They were then requested to explain their choice. They were also asked to give feedback on the research. Finally, those who declined the conversation got the opportunity to participate in the lottery. However, none of the people who did not give permission for the conversation sent their code.

By asking permission to continue the conversation the dialogue system ensures that the participant is actually open to discussion of his behaviour and that he is prepared to potentially change it. The people who do not feel any need to change their diet are filtered out.
It also serves as a way to facilitate participants’ sense of autonomy: the intervention does not force the participants to have the conversation.

3.3.1.5 Value domain endorsement
Respondents who did give permission had to indicate their value domain endorsement by ranking and grading the degree to which they endorsed the three value domains. This is where the intervention started the MI-process of focusing on specific topics. The intervention explored which (sub)topics are relevant to this particular individual.

Value domain ranking was done by having respondents rank the different value domains (health, environment and animal welfare) in order of importance: “Suppose you are making a choice concerning nutrition. For example, you are ordering a meal in a restaurant or you are doing groceries. Can you rank to what extent the following factors play a part in your choice? (1 = most important, 3 = least important)”. They had to rank the following options: “That my nutrition is good for the environment”, “That my nutrition is good for animal welfare”, and “That my nutrition is good for my health”. This question can be seen as a form of value clarification, a technique used for evoking during MI.

Value domain adherence was assessed, using a 7-point Likert scale (1 = Very unimportant, 7 = Very important). Respondents had to rate the same three items from the previous question. This was done in order to get a better understanding of the exact importance respondents attach to a certain value domain.

3.3.1.6 General information
Subsequently, the intervention provided short, general information on a more plant-based lifestyle. A specification of a “more plant-based lifestyle” was given: “More and more people are choosing to replace animal nutrition with plant-based nutrition during one or more days per week. This could mean that people do not eat meat or fish, but also that they omit eggs and dairy from their nutrition.” A few examples of plant-based foods were mentioned. Furthermore, the three main reasons for choosing a more plant-based lifestyle (health, animal welfare and the environment) were briefly explained. This information was given to ensure that all participants would have similar baseline knowledge of the subject.

3.3.1.7 Disengagement belief endorsement
Disengagement belief endorsement was assessed by letting participants rank their top three most important reasons for eating meat from a list of 16 disengagement beliefs (“Which three of these statements are the most important to eat meat for you personally?”). The statements were derived from Piazza et al.’s (2015) 4N-scale items. The items were displayed in random order, as to prevent an item order effect (Baxter & Babbie, 2004: p.169).

Similar to the value domain questions, the respondents then had to indicate their DB-adherence. They did this by specifying how important they perceived their top three disengagement beliefs to be. They rated the three statements on a 7-point Likert scale, ranging from ‘Very unimportant’, to ‘Very important’.

The tailoring module was introduced by the following text: “In conclusion, there are many different reasons to eat meat. However, one can just as well think of arguments to eat plant-based more often. The form of that last one can diverge tremendously, varying from having one meatless day per week, to consuming fully plant-based on a daily basis. I would like to present you a number of motives to eat plant-based more often, because I am curious about your outlook on them. It is of course up to you to decide what you want to do with it!”

This statement marks the start of the MI-process of evocation. The intervention provides one last clarification of the meaning of “a more plant-based diet”, thereby emphasizing participants’ freedom in interpreting the desired behaviour. The last two sentences were based on the recommendations of Miller & Rollinick (2013: 142), who state that during MI information
should be provided using autonomy-supportive language. This type of formulation could help increase the respondents' receptiveness to the given information.

In the tailoring module, the participants’ motivation to change is evoked by discussing advantages of a more plant-based diet and disadvantages of the consumption of animal nutrition. After this introductory text, the experimental manipulation started in the tailoring module, branching off all three conditions.

3.3.2 Tailoring module

3.3.2.1 Hypothetical condition: DBH

In order to reduce the duration of the experiment, only the two disengagement beliefs ranked as ‘most important’ by the participant were handled. The two DB’s were handled consecutively. This was done by asking what-if questions. The core message of these what-if questions was: “Suppose you would discover that your selected favourable characteristic of meat consumption is also applicable to plant-based nutrition? Would you then be willing to make the shift towards a more plant-based diet?” The exact content of the question was based on the selected DBs. Both questions had a similar structure. First, the selected statement was paraphrased (e.g. “You have selected that according to you it isn’t possible to get all essential nutrients from an all plant-based diet” or “You say meat adds so much flavour that it’s illogical to leave out”). Then, the intervention rolled with resistance by expressing empathy (e.g. “That is hard to deny!”, “That’s a recognizable thought!” or “That’s also a very understandable argument”).

Following this, a hypothetical situation was sketched in which the opposite of the selected DB was true (e.g. “But what if you find out that it is in fact possible to get all the proteins, vitamins and minerals you need from non-animal food and drinks?”) or in which the same favourable characteristic of meat was also applicable to plant-based food (e.g. “But imagine you discover that it’s also possible to prepare tasty meals with plant-only ingredients...”).

Finally, the intervention asked how this hypothetical situation would influence their position on a more plant-based diet. This final question is identical in both DBH questions. Respondents could select either “I would be open to a (more) plant-based eating pattern” or “I would not be open to a (more) plant-based eating pattern”. Once a participant had selected the first option, the individual was immediately redirected to the beginning of the behavioural module (the general conclusion).

3.3.2.2 Hypothetical condition: VD-tailoring

After the two DBH questions, the value domain ranked as ‘most important’ was handled in a similar way. But whereas the DB counterargumentation emphasized the benefits of plant-based nutrition, the value domain counterargumentation was framed in terms of the disadvantages of eating meat and other animal products. As a whole, the argumentation given by the intervention can be summarized into one core message: “Eating more plant-based food can be both [normal/ nice/ necessary/ natural] and [normal/ nice/ necessary/ natural], and by doing so [your health/ the environment/ animal welfare] will also benefit”.

This VD-counterargumentation also had a what-if structure. For example: “According to you, the effect of your nutrition on [Value domain number one] is the most important factor whenever you select your food. Now imagine you find out that having a (more) plant-based diet has substantially less harmful consequences for [Value domain number one] than your current diet. What consequences would that have for your attitude towards an eating pattern with more plant-based, and less animal nutrition?” Respondents could once more choose between either “I would be open to a (more) plant-based eating pattern” or “I would not be open to a (more) plant-based eating pattern”.
3.3.2.3 Non-hypothetical condition: DBH

The non-hypothetical condition had a comparable structure. The two most important disengagement beliefs and the most important value domain were all handled- or provided with tailored counterargumentation. Each subject was followed by the same final question. The informational texts for this condition can be found in Appendix C (DB counterargumentation) and D (VD-counterargumentation). Once a respondent had expressed a favourable attitude after a question, respondents were also immediately redirected to the behavioural module.

However, as opposed to the hypothetical condition, both DBH and VD-tailoring were done by providing the respondents with evidence-based, factual information. It can thus be seen as the non-hypothetical condition. The information was substantiated by providing footnotes with references to the primary sources. This was done to increase the reliability of the facts given. For collecting the information, the researcher pursued the following guidelines:
- Statistical information had to be generalizable to the Dutch population, unless data on this specific subset of people was unavailable. It was explicitly mentioned whenever data was derived from a larger population (e.g. from the Benelux or from EU-countries).
- Sources had to be credible and independent, for example national and international public organisations and scientific institutions.
- Information had to be based on peer-reviewed scientific studies. If possible, meta-analyses or large scale (longitudinal) studies were used.

A number of precautions were taken in order to create information texts with a similar length and number of arguments across the various disengagement beliefs and value domains. The information was provided in bullet points with one or two sentences each. Objective wording was used. Furthermore, no action-directed information (e.g. “You should eat plant-based more often”) was given. This was done to stimulate personal interpretation of the subsequent behavioural steps by the participant. Miller & Rollnick (2013: 143) state that coercive language should be avoided, since it could undermine the sense of autonomy of the conversational partner.

Similar to the beginning of the DBH questions in the hypothetical condition the selected ratification was paraphrased, followed by an empathic response (e.g. “You have just indicated that you think humans naturally crave meat. That’s a recognizable thought!”). Then, the information text was introduced (e.g. “However, information showing a different perspective can also be found. I have listed two of these arguments below”). Each DB-information text contained one or two arguments. There was also a possibility that a respondent would choose two DB’s from the same 4N-category. To prevent double argumentation within the DBH blocks, each disengagement belief was therefore substantiated with different facts.

3.3.2.4 Non-hypothetical condition: VD-tailoring

After the DBH block, tailored information on the value domain perceived most important by the respondent was provided. Again, the value domain ranked as most important was paraphrased, and the information was introduced using autonomy-supportive language: “Earlier during our conversation you have indicated that [value domain] is important to you. As you probably already knew, each food choice you make has a different influence on [value domain]. For example, there are various studies that appear to demonstrate a link between the consumption of animal nutrition products and certain [threats to value domain]. Since I am curious about your opinion, I would like to present you some of these findings.” The information was then provided.

Because of the relatively large and multidimensional scope of the topics concerned, the value domain information texts contained more and longer arguments than their DB-counterparts. All VD-texts contained three bullet points, each made up of two arguments. Every bullet point discussed a new subtopic. For example, animal welfare was substantiated by arguments in the field of animal health, number of animals saved by a (semi-)vegetarian lifestyle, and animal (emotional) intelligence.
3.3.2.5 Control group condition: VD-tailoring

In contrast to the experimental conditions, DBH was absent in the control group condition. Participants in the control group only received information tailored on their number one value domain. This was presented in the same way as in the non-hypothetical condition.

3.3.3 Behavioural module

3.3.3.1 General conclusion

In the behavioural module, the experimental manipulation ended, branching all conditions together again. The module started with a general message, concluding the tailored blocks: “Anyhow, it is very well possible to stay fit and healthy with a (more) plant-based diet! Moreover, it has numerous advantages, among other things in the field of environment, health and animal welfare. But I also understand very well that eating meat, milk and eggs also has its advantages ;) So it’s up to you what to do next...” The last sentence served to repeat the intervention’s concern with the participants’ freedom of choice. In order to strengthen the feel of a real human conversation a small informal intermezzo was inserted in between: “We’ve been talking for a little while now. Are you still holding on? I would like to ask you a few more questions...”

3.3.3.2 Attitude

Attitude was assessed by asking participants about their position on a societal shift towards a more plant-based diet: “What would your attitude be if people in the Netherlands would eat more plant-based food?” They had to give an indication using a 7-point Likert scale, ranging from ‘Very negative’ to ‘Very positive’.

This construct was measured, since it is one of the three determinants of intention, according to the Integrative Model of Behavioural Prediction (IMBP; Yzer, 2012). The other two determinants of intention are efficacy (the individual’s

<table>
<thead>
<tr>
<th>Grade from participant</th>
<th>Feedback by intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>“You have indicated that your motivation to adapt your eating pattern is 0. I think that’s a pity, but of course I respect your decision! I would still like to ask you to answer a few more questions.”</td>
</tr>
<tr>
<td>1-3</td>
<td>“It seems like reducing the amount of animal products in your diet doesn’t have a very high priority for you. But you also didn’t score 0!”</td>
</tr>
<tr>
<td>4-6</td>
<td>“It seems like reducing the amount of animal products in your diet isn’t very important to you, but also certainly not unimportant!”</td>
</tr>
<tr>
<td>7-10</td>
<td>“Your motivation to change is very high!”</td>
</tr>
</tbody>
</table>

Table 6: Motivation assessment and the corresponding responses by the intervention.

<table>
<thead>
<tr>
<th>Grade from participant</th>
<th>Feedback by intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>“It seems like you don’t have a lot of trust in your own ability to change your diet. What could help you to increase your confidence?” [+text box]</td>
</tr>
<tr>
<td>4-6</td>
<td>“I can tell that you have quite some trust in changing your diet!”</td>
</tr>
<tr>
<td>7-10</td>
<td>“Good to see that your confidence is so high!”</td>
</tr>
</tbody>
</table>

Table 7: Self-efficacy assessment and the corresponding responses by the intervention.
confidence to perform a specific behaviour), and perceived norm (the social pressure an individual experiences towards performing a certain type of behaviour). Intention is often used as the most reliable predictor of voluntary behaviour in health communication research. The present intervention has attempted to influence participants’ attitude towards a more plant-based diet. The measure therefore also serves to determine whether this endeavour has been successful.

3.3.3.3 Motivation ruler
Motivation was measured with the following question: “Could you grade your motivation to eat more plant-based nutrition, instead of animal nutrition?” Participants could select a number on an 11-point Likert scale/motivation ruler (0=Absolutely no motivation, 10=Very high motivation). The motivation ruler serves to make the respondent reflect on the advantages and disadvantages of having a more plant-based diet.

The intervention gave positive tailored feedback, based on the selected number (Table 6). This type of response was based on recommendations made by Markland et al. (2005) to cater to the basic psychological needs during MI. This catering was done by rolling with resistance and by providing positive feedback. However, respondents who indicated that their motivation to change was zero were redirected to the evaluation questions. Motivation to change is the foundation for change talk. A person without motivation will probably not evoke any form of change talk.

3.3.3.4 Confidence ruler
The IMBP variable Self-efficacy (SE) was also assessed with an 11-point Likert scale/confidence ruler, one of the other fixed components of MI-conversations. The following question was asked: “Could you also grade your confidence in your ability to eat more plant-based food? (0=absolutely no confidence, 10=very high confidence)”. Again, the response given by the intervention was based on the respondents’ grade (Table 7). The feedback texts were derived from Friederichs, et al. (2014: p.9). People who scored from zero to three in this question were requested to give suggestions on methods to increase their confidence in a text box. With this question, respondents were stimulated reflect on possible solutions for their lack of perceived self-efficacy.

The confidence ruler is a form of confidence talk, which in turn is a form of preparatory change talk (Miller & Rollnick, 2013). The confidence ruler helped the participants to reflect on their ability to change their behaviour. This lays the foundations for the next step, change talk.

3.3.3.5 Behavioural intention
After the self-efficacy assessment, the MI-process of planning started. This is where respondents expressed the actual change talk: they indicated their commitment to change by illustrating their behavioural intention. They did this by planning out their intended future diet. The intervention therefore asked: “How many days per week do you intend to adhere to the following eating patterns in the future? Please indicate only full days, so both during breakfast, lunch, and dinner.” This question closely resembled the question in the first module, where respondents indicated their current dieting behaviour. Again, participants filled out the number of full days behind each of the four following statements: “I want to eat fully plant-based for [...] days per week”, “I want to eat fully vegetarian for [...] days per week”, “I want to eat smaller portions of meat for [...] days per week”, and “I want to eat normal portions of meat for [...] days per week”. The total sum of the participants’ answers had to equal ‘7’.

3.3.3.6 Time frame
Furthermore, respondents were asked to take the next step in creating a commitment to the desired behaviour. They did this by specifying within what time frame they intended to apply this intended eating pattern (‘Within a week’, ‘Between two and four weeks’, ‘Between two and
three months’, ‘Between four months and a year’ or ‘Not applicable’). Those who selected the first two options got a positive response (“That’s fast! Good to hear!”), whereas those who selected two months or longer got a more encouraging response (“You prefer taking a bit more time. No problem at all! I understand it’s not easy to change your diet within a month already. A lot of people gradually start reducing the share of animal products in their diet”).

3.3.3.7 Evaluation: Psychological needs and counterarguing
In the final question, it was evaluated to what extent the intervention had succeeded in catering to the basic psychological needs for autonomy, relatedness, and competence. Furthermore, counterarguing was measured, to investigate whether or not participants had experienced reactance (Brehm, 1966; Miller & Rollnick, 2013).

The intervention asked the participants to evaluate the intervention by scoring their agreement with the statements on a 7-point Likert scale, ranging from “Strongly disagree” to “Strongly agree”. The items assessing the psychological needs were based on the items used by Friederichs et al. (2014) The items assessing the psychological needs were adapted from items used by Moyer-Gusé & Nabi (2010). The avatar name displayed in the items was based on the respondents’ avatar choice.

*Perceived autonomy* (PA) was measured with the following items: “[Laura/ Marc] has helped me to create my own ideas about my diet”, and “[Laura/ Marc] assumed I am the one who knows most about myself”. *Perceived relatedness* (PR) was assessed with “It felt like [Laura/ Marc] considered my personal situation”. *Perceived competence* (PC) was comprised of two items: “I have received new information on a (more) plant-based diet during the conversation with [Laura/ Marc]”, and “[Laura/ Marc] has helped me with creating plans to eat plant-based more often”. *Counterarguing* (CA) was assessed with “I was looking for mistakes in [Laura/ Marc]’s story”, and “I sometimes felt the urge to oppose [Laura/ Marc]”. Reliability analyses revealed that none of the items had a Cronbach’s Alpha of over 0.7 ($\alpha_{PA}=.51$; $\alpha_{PC}=.60$; $\alpha_{CA}=.53$). It was therefore decided to measure each item individually.

Finally, the system asked respondents whether they had any remarks on- or suggestions for the intervention. After the participants had completed all questions, the intervention thanked them for their cooperation to the study. They also received a wincode for participating in the lottery.

3.4 Procedure
The study took place over a period of twelve days in July 2017. Participants were recruited via various public Facebook groups and via the personal network of the researcher (both via e-mail and Facebook). The message displayed the following promotional text, along with the link to the intervention: “Do you want to have a chance to win one of the ten Bol.com gift cards with a value of ten euros? And do you want to help me graduate? Please take part in this online research on your eating pattern! Taking part will cost you approximately 10 to 15 minutes. Your results will be processed anonymously(…) Conditions for participation: (1) You are at least 18 years old; (2) You eat meat at least once per week.”

Those who shared the Facebook message could participate in an extra lottery, in which they could win one of two ten euro gift cards. This was done to stimulate distribution. 15 people shared the message on their Facebook profile. People who clicked on the link were redirected to the intervention in Qualtrics. They immediately saw the images of both avatars, who introduced themselves and the conversational topic, as described in paragraph 3.3.1.1. After selecting one of both avatars the dialogue started.

3.5 Analysis
Results were analysed using SPSS. Patterns in behavioural intention were analysed for all four types of behaviour (i.e. eating plant-based, eating vegetarian, reducing portion size, and maintaining normal portion size). This was done by means of a Repeated Measures Analyses
of Variance. Current dieting behaviour and behavioural intentions were used as repeated measures. To compare the intention-scores per condition Sex (Levels: ‘Male’ and ‘Female’) and Condition (Levels: ‘Hypothetical’, ‘Non-Hypothetical’, and ‘Control’) were used as factors. To compare the intention-scores between the experimental and the control group Sex (Levels: ‘Male’ and ‘Female’) and the new variable ‘DBH condition’ (Levels: ‘DBH conditions’ and ‘Non-DBH conditions’) were used as factors.

Furthermore, between-groups Univariate Analyses of Variance (ANOVAs) were conducted to investigate patterns in Attitude, Motivation, Self-Efficacy, Perceived Autonomy, Perceived Competence, Perceived Relatedness, and Counterarguing. Three different factor designs were used, which are displayed in table 8.

| Factor 1 |  | Factor 2 |  |
|----------|---------------------|---------------------|
| **Factor** | **Levels** | **Factor** | **Levels** |
| 1 | Sex | Condition | - Hypothetical | - Male |
|  | | | - Non-hypothetical | - Female |
|  | | | - Control |
| 2 | Sex | DBH condition | - DBH conditions | - Male |
|  | | | - Non-DBH condition | - Female |
| 3 | Sex | Avatar | - Marc | - Male |
|  | | | - Laura | - Female |

*Table 8: Factor designs for the Univariate Analyses of Variance.*

### 4. Results

#### 4.1 General findings

4.1.1 Avatar choice

The distributions of men and women were comparable for both avatars: men accounted for 37.5% of group ‘Laura’, and for 38.5% of group ‘Marc’ (Table 9). This percentage matched the distribution of the total sample population, where 37.7% of participants was male. This suggests that men and women did not differ very much in their preferences for one of both avatars.

<table>
<thead>
<tr>
<th></th>
<th>Marc</th>
<th>Laura</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>15</td>
<td>45</td>
<td>60</td>
</tr>
<tr>
<td>Female</td>
<td>24</td>
<td>75</td>
<td>99</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>120</td>
<td>159</td>
</tr>
</tbody>
</table>

*Table 9: Avatar choice.*

4.1.2 Denial of permission

Fourteen people did not give permission to continue the conversation. This number is substantially higher than in Hagen’s (2016) research population (N=2). This could be caused by differences in the phrasing of the consent questions in both versions of the intervention. Some subtle adaptations in the tone of the consent question were made for the present version of the intervention. Hagen’s consent question started with “In this programme I will have a conversation with you about the benefits of a plant-based eating pattern, so without meat, fish, or other animal products”. The question was rephrased for the current version: “In this programme I would like to have a conversation with you about the benefits of a more plant-based eating pattern, so with less meat, fish, or other animal products.”

There were two important differences between Hagen’s version and the present version of the permission request. First of all, “I will” was replaced by “I would like to”, in order to convey
a more autonomy-supportive message. Secondly, a more nuanced version of the conversational topic (“a more plant-based lifestyle, so with less meat [...]” versus “a plant-based lifestyle, so without meat [...]”) was presented. This leaves more room for personal interpretation by the respondent. The first formulation could imply eating vegetarian for one day per week, but also having a completely vegan diet, whereas the latter formulation leaves room for only one interpretation. Both adaptations were made to stimulate the respondents’ sense of autonomy.

The rest of the question itself remained unchanged: “It’s important to me that you decide for yourself what you want to talk about and what you don’t. So, what do you think of talking about your diet, and possible changes in it?” However, the answer options were also phrased differently in Hagen’s intervention. In her version participants could select either “yes” or “no”. In the current version of the intervention the answer options were phrased more specifically in terms of consent (“I give permission to talk about my eating pattern” or “I don’t give permission to talk about my eating pattern”). Perhaps the different formulation of the consent question enhanced respondents’ sense of autonomy. One other explanation could be that it was clearer to the respondents that the avatar was asking permission to continue the conversation.

Participants who did not give permission mostly indicated that they did not feel a need to change and that they felt comfortable with their current diet. One respondent indicated that he had accidentally clicked the wrong button and that he could not return.

4.1.3 Value domain endorsement
The value domain health was selected by 87.4% of respondents as number one in the value domain ranking, followed by environment (6.9%), and animal welfare (5.7%). The number two position displayed a different distribution of the various domains: animal welfare accounted for 45.3%, environment for 43.4%, and health for 11.3%. Finally, most people ranked environment as their least important value domain (49.7%), followed by animal welfare (49.1%), and health (1.3%).

Assessment of value domain adherence revealed a pattern similar to the number one distribution. Health had the highest mean scores. It was perceived to be ‘important’ to ‘very important’ (M=6.26; SD=.84). On average, both environment (M=4.92; SD=1.17) and animal welfare (M=4.83; SD=1.24) were perceived to be ‘slightly important’.

![Figure 1: Distribution of the 4N-categories across the three different ranks.](image-url)
4.1.4 Disengagement belief endorsement

Participants mostly endorse disengagement beliefs from the Nice category, followed by Necessary, Normal, and Natural (Figure 1). “Meat is delicious” (N=84), “A healthy diet requires at least some meat” (N=26), and “You cannot get all the protein, vitamins, and minerals you need on all plant-based diet” (N=13) were among the most selected number one statements. On the second position, most participants selected “You cannot get all the protein, vitamins, and minerals you need on all plant-based diet” (N=24), “The best tasting food is normally a meat based dish (e.g. steak, chicken filet, bacon)” (N=24), “A healthy diet requires at least some meat” (N=22), and “Meat adds so much flavour to a meal it does not make sense to leave it out” (N=20).

Value domain adherence reflected a similar trend. On average, the Nice-statements got the highest importance scores (M=5.20, SD=1.32), followed by Necessary (M=5.01, SD=1.51), Natural (M=3.88, SD=1.73), and Normal (M=3.84, SD=1.51). Based on these results it appears that respondents mostly consumed meat because of its sensory appeal or the hedonic pleasure they derive from the behaviour. They also appeared to think that humans need meat for survival, or that we need at least some meat to function as strong and healthy individuals.

These results are notably different from the results found by Piazza et al. (2015: p.117). In their studies, most respondents endorsed the Necessary arguments (respectively 36% and 42%), followed to a lesser extent by either Nice (respectively 18% and 16%) or Natural (respectively 17% and 23%). Perhaps these different results can be ascribed to the different cultures of the participants used in Piazza et al.’s study. The participants from this study were recruited in the Netherlands, whereas Piazza et al. recruited their participants in the United States. It may be that this different perception of meat consumption is caused by cultural differences. According to the IMBP, culture is one of the indirect factors that influence the three determinants of behavioural intention (Yzer, 2012).

![Flowchart of participants in the three conditions (+ cumulative percentage of outflow per condition sample)](image)

Figure 2: Flowchart of participants in the three conditions (+ cumulative percentage of outflow per condition sample).
4.1.5 Willingness to change
The tailoring module in both experimental conditions consisted of three “building blocks”: the first DBH block, the second DBH block, and finally the VD-tailoring block. For the control group condition this module only contained the VD-tailoring block. Participants who indicated that they were open to a more plant-based lifestyle were redirected to the attitude question, thereby skipping the following blocks in the tailoring module. In figure 2 this outflow of participants is illustrated with a horizontal arrow. Outflow rates for both experimental conditions appeared to be relatively similar.

4.1.6 Dropout rates
An explorative analysis was conducted to analyse patterns in quitting rates. Dropouts are defined as participants who did not complete a 100% of the intervention. A total number of 132 participants left the intervention before completion. Dropout rates differed substantially across the various conditions, as can be seen in table 10. Furthermore, respondents in the hypothetical conditions displayed considerably less progress than those in the non-hypothetical and control group condition.

Perhaps the provision of non-hypothetical information (for both the DBs and the VDs) led to higher engagement among participants. Another explanation for these results could be that they were more interested in information about the value domains, than in the information about the DBs. Respondents in the control group first encountered the VD-tailoring block, whereas respondents in the experimental conditions first encountered the DBH-blocks.

<table>
<thead>
<tr>
<th></th>
<th>N_{Total}</th>
<th>N_{Dropout}</th>
<th>Dropout rate</th>
<th>M</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothetical</td>
<td>96</td>
<td>51</td>
<td>53.1%</td>
<td>8.2%</td>
<td>1.18</td>
</tr>
<tr>
<td>Non-hypothetical</td>
<td>106</td>
<td>44</td>
<td>41.5%</td>
<td>50.4%</td>
<td>1.89</td>
</tr>
<tr>
<td>Control group</td>
<td>106</td>
<td>37</td>
<td>34.9%</td>
<td>85.8%</td>
<td>.46</td>
</tr>
<tr>
<td>Total</td>
<td>308</td>
<td>132</td>
<td>42.9%</td>
<td>44.0%</td>
<td>2.87</td>
</tr>
</tbody>
</table>

Note. Dropout rate= percentage of “quitters” per (sub)population; M= mean progress score for the dropouts; SE= standard error for the dropouts.

Table 10: Dropout statistics.

4.2 Attitude
A Univariate Analysis of Variances revealed no significant effects of Condition on Attitude towards adopting a more plant-based diet (p>.40). Sex did have a marginally significant effect on Attitude (F(1,153=3.27; p=.07). Women (M=5.77; SE=.11) scored significantly higher on this measure than men (M=5.44; SE=.14). This is not surprising: on average, women are more likely to have favourable attitudes towards vegetarianism than men (Ruby, 2012). No interaction effect between Sex and Condition on Attitude was found (p>.42). Furthermore, other ANOVAs revealed no significant main effects of DBH (p>.44), or Avatar (p>.62).

4.3 Motivation
An ANOVA showed a marginally significant main effect of Condition on participants’ motivation to eat more plant-based food (F(2,153)=2.61; p=.08). A post hoc analysis of this effect led to the discovery of two (marginally) significant differences. First, it appeared that respondents in the hypothetical condition displayed a significantly higher Motivation score (p=.04) than those in the Control group condition (Table 11). Second, a marginally significant effect (p=.07) was found for the non-hypothetical and the control group condition. The non-
Hypothetical Non-hypothetical Control group

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SE</th>
<th>M</th>
<th>SE</th>
<th>M</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>5.84</td>
<td>.15</td>
<td>5.52</td>
<td>.16</td>
<td>5.61</td>
<td>.14</td>
</tr>
<tr>
<td>Motivation</td>
<td>7.79</td>
<td>.29</td>
<td>7.48</td>
<td>.22</td>
<td>7.11</td>
<td>.24</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>7.53</td>
<td>.24</td>
<td>7.37</td>
<td>.25</td>
<td>6.95</td>
<td>.14</td>
</tr>
<tr>
<td>PA1</td>
<td>3.81</td>
<td>.24</td>
<td>3.67</td>
<td>.20</td>
<td>3.63</td>
<td>.17</td>
</tr>
<tr>
<td>PA2</td>
<td>5.23</td>
<td>.17</td>
<td>4.94</td>
<td>.18</td>
<td>4.77</td>
<td>.16</td>
</tr>
<tr>
<td>PR</td>
<td>3.83</td>
<td>.23</td>
<td>4.23</td>
<td>.22</td>
<td>4.31</td>
<td>.17</td>
</tr>
<tr>
<td>PC1</td>
<td>3.86</td>
<td>.29</td>
<td>3.92</td>
<td>.22</td>
<td>4.30</td>
<td>.22</td>
</tr>
<tr>
<td>PC2</td>
<td>3.63</td>
<td>.25</td>
<td>3.79</td>
<td>.18</td>
<td>3.67</td>
<td>.16</td>
</tr>
<tr>
<td>CA1</td>
<td>3.58</td>
<td>.21</td>
<td>3.94</td>
<td>.24</td>
<td>3.34</td>
<td>.22</td>
</tr>
<tr>
<td>CA2</td>
<td>2.70</td>
<td>.24</td>
<td>2.85</td>
<td>.22</td>
<td>2.42</td>
<td>.21</td>
</tr>
</tbody>
</table>

Table 11: Mean scores and standard errors for the outcome variables.

Accompanying the Hypothetical group was a significant main effect of Sex on Motivation (F(1,153)=9.27; p=.03). Overall, female participants (M=7.77; SE=.18) reported a higher motivation than their male counterparts (M=6.87; SE=.24). No interaction effect between Sex and Condition on Attitude was found (p>.25).

4.4 Self-efficacy

No significant main effects of Condition (p>.16) or Sex (p>.46) on Self-efficacy scores were found, after conducting a Univariate Analysis of Variance. Furthermore, no interaction effect was found for Sex x Condition (p>.64). However, a marginally significant effect of DBH condition (F(1,155)=3.83; p=.05) was found after running another ANOVA (Factors: DBH condition and Sex). Further analysis suggested that participants in the DBH conditions (M=7.44; SE=.18) scored marginally significantly higher (p=.05) on Self-efficacy measures than participants in the non-DBH condition (M=6.86; SE=.23).

4.5 Intention

The subpopulations of the three conditions appeared to display a large variability in their average current dieting behaviour (Table 12). For that reason, it was decided to use participants’ Current behaviour and their Behavioural intention as repeated measures for intention (Figure 3A-2L). The new variable was referred to as ‘PrePost’.

Note. PA1= Perceived Autonomy 1 (“[Laura/ Marc] has helped me to create my own ideas about my diet.”)  
PA2= Perceived Autonomy 2 (“[Laura/ Marc] assumed I am the one who knows most about myself.”)  
PR= Perceived Relatedness (“It felt like [Laura/ Marc] considered my personal situation.”)  
PC1= Perceived Competence 1 (“I have received new information on a (more) plant-based diet during the conversation with [Laura/ Marc].”)  
PC2= Perceived Competence 2 (“[Laura/ Marc] has helped me with creating plans to eat plant-based more often.”)  
CA1= Counterarguing 1 (“I sometimes felt the urge to oppose [Laura/ Marc].”)  
CA2= Counterarguing 2 (“I was looking for mistakes in [Laura/ Marc]’s story.”)
4.5.1 Effects of intervention exposure on Intention

A Repeated Measures Analysis of Variance (factors: Sex and Condition) revealed significant main effects of exposure to the intervention on all four subtypes of dieting intention, regardless of condition. This signals a significant increase in the number of days people intend to eat plant-based (F(1,153)=43.00; p=.00), vegetarian (F(1,153)=29.80; p=.00), and smaller portions of meat (F(1,153)=8.92; p=.01) (Table 11). Intention to maintain normal portion sizes of meat decreased significantly (F(1,153)=106.05; p=.00).

Furthermore, an marginally significant interaction effect was found of Sex x PrePost on intention to eat vegetarian (F(1,153)=3.38; p=.07). Further analysis revealed that both men (M_C=1.05; SD_C=.18; M_B=1.40; SD_B=.18; p=.02) and women (M_C=1.56; SD_C=.16; M_B=2.27; SD_B=.16; p=.00) displayed a significant increase in intention to eat vegetarian after exposure to the intervention. No other interaction effects of Sex x PrePost were found for either intention to reduce portion size (p>.71), or intention to maintain normal portion sizes (p>.37). No interaction effects were found for Condition x PrePost either.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Hypothetical</th>
<th>Non-hypothetical</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CB</td>
<td>BI</td>
<td>CB</td>
<td>BI</td>
</tr>
<tr>
<td>Plant-based</td>
<td>M</td>
<td>.50</td>
<td>(.76)</td>
<td>.14</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>.31</td>
<td>(.00)</td>
<td>.93</td>
</tr>
<tr>
<td></td>
<td>Tot.</td>
<td>.37</td>
<td>(.93)</td>
<td>1.00</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>M</td>
<td>1.29</td>
<td>(1.20)</td>
<td>1.79</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.81</td>
<td>(1.79)</td>
<td>2.45</td>
</tr>
<tr>
<td></td>
<td>Tot.</td>
<td>1.64</td>
<td>(1.63)</td>
<td>2.23</td>
</tr>
<tr>
<td>Reduce portion size</td>
<td>M</td>
<td>1.29</td>
<td>(1.27)</td>
<td>1.57</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.83</td>
<td>(2.11)</td>
<td>2.14</td>
</tr>
<tr>
<td></td>
<td>Tot.</td>
<td>1.65</td>
<td>(1.88)</td>
<td>1.95</td>
</tr>
<tr>
<td>Maintain normal portion size</td>
<td>M</td>
<td>3.93</td>
<td>(2.67)</td>
<td>2.50</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.05</td>
<td>(2.71)</td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td>Tot.</td>
<td>3.34</td>
<td>(2.70)</td>
<td>1.81</td>
</tr>
</tbody>
</table>

Table 12: Mean scores (plus standard deviations) of current behaviour and behavioural intention.
4.5.2 Effects of Condition on Intention

The same analysis also revealed a marginally significant main effect of Condition on Intention to eat plant-based (F(2,153)=2.48; p=.09). A post hoc analysis showed that the Intention score for the hypothetical condition (M=.72; SE=.13) was significantly higher (p=.04) than for the non-hypothetical condition (M=.36; SE=.11).

Furthermore, a significant main effect of Condition on Intention to eat vegetarian was found (F(2,153)=3.43; p=.04). A follow-up analysis exposed the source of this effect: participants in the hypothetical condition (M=1.83; SE=.22) displayed significantly higher Intention scores (p=.02) than in the control group condition (M=1.17; SE=.18).

No other main effects of condition on either Intention to reduce portion size (p>.33) or Intention to maintain normal portion sizes were found (p>.50). In addition, no interaction effects of Sex x Condition on any of the subtypes of Intention were found (plant-based: p>.18; vegetarian: p>.79; smaller portions: p>.22; normal portions: p>.96).

*Figure 3A-2L: Mean scores of current behaviour (CB) and behavioural intention (BI).*
4.5.3 Effects of Sex on Intention

Again, a Repeated Measures Analysis of Variance showed significant main effects of Sex on Intention to eat vegetarian (F(1,153)=9.21; p=.04), and Intention to maintain normal portion sizes (F(1,153)=9.34; p=.00). Further exploration of these results showed that women had a significantly higher Intention (p=.00) to eat vegetarian (M=1.91; SE=.14) than men (M=1.22; SE=.18). Conversely, when it comes to maintaining normal portion sizes men (M=3.50; SE=.28) scored significantly higher (p=.00) than women (M=2.43; SE=.21). No main effects of Sex on Intention to eat plant-based (p>.82), or on Intention to reduce portion size were found (p>.11).

4.5.4 Effects of DBH on Intention

Another Repeated Measures Analysis of Variance was carried out (factors: Sex and DBH Condition), in order to determine to what extent the act of DBH itself had influenced Intention, compared to the non-DBH condition. A significant main effect of DBH condition on intention to eat vegetarian was found (F(1,155)=6.89; p=.01). Participants in the experimental conditions indicated having a higher behavioural intention (M=1.76; SE=.14) than participants in the control group condition (M=1.17; SE=.18).

However, Intention to eat plant-based (p>.46), smaller portions (p>.22), and normal portions (p>.27) all did not display any significant main effects. Furthermore, no significant interaction effects between Sex x DBH Condition were found (plant-based: p>.10; vegetarian: p>.51; smaller portions: p>.11; normal portions: p>.92).

4.6 Evaluation variables

4.6.1 Effects of Condition on Evaluation variables

A Univariate Analysis of Variance (factors: Sex and Condition) did not yield any significant main effects of Condition on any of the outcome variables. However, a number of marginally significant interaction effects of Sex x Condition on Perceived Relatedness (F(2,153)=2.80; p=.06) and both Perceived Competence-items were found (F(2,153)=2.46; p=.09; and F(2,153)=2.57; p=.08).

Several post hoc analyses were carried out to explore these effects. Perceived Relatedness scores of men did not differ significantly between any of the conditions (p>.33). However, there was a significant effect of condition among women (F(2,96)=3.34; p=.04). PR-scores of women in the hypothetical condition (M=3.72; SE=.25) were significantly lower (p=.01) than those of women in the non-hypothetical condition (M=4.67; SE=.26).

Furthermore, men’s scores for both PC1 (p>.28) and PC2 (p>.35) PC2 did not differ significantly between any of the conditions. However, women in the hypothetical condition (M=3.48; SE=.32) scored significantly lower (p=.04) on PC1 than their counterparts in the control group (M=4.35; SE=.26).

Moreover, a marginally significant difference (p=.07) between women in the hypothetical (M=3.38; SE=.25) and women in the non-hypothetical condition (M=4.04; SE=.26) was found for PC2. Women in the latter group scored higher on PC2 than those in the first group.

4.6.2 Effects of Sex on Evaluation variables

No main effects of sex on any of the evaluation variables were found. Interaction effects were already discussed in the previous paragraph.

4.6.3 Effects of DBH on Evaluation variables

An ANOVA showed a marginally significant main effect of DBH on CA1 ("I sometimes felt the urge to oppose [Marc/Laura].") (F(1,155)=3.24; p=.07). Mean scores for this item were higher
among the DBH conditions (M=3.84; SE=.17) than in the control group condition (M=3.34; SE=.22). No main effects of DBH on any of the other evaluation variables were found.

4.6.4 Effects of Avatar on Evaluation variables

No main effects of Avatar choice on any of the evaluation variables were found. However, Sex x Avatar did have one significant interaction effect, on Perceived Relatedness (F(1,155)=6.46; p=.01). A post hoc analysis was carried out to explore the nature of this effect. A marginally significant effect of Avatar, p=.07, was found among men (F(1,58)=3.40). Men who had chosen Marc (M=4.73; SE=.41) scored marginally higher on PR than men who had chosen Laura (M=3.87; SE=.24).

5. Conclusion

For this study, three versions of a MI-based dialogue system were devised: two for the experimental conditions and one for the control group condition. The experimental conditions differed in the type of disengagement belief handling they engaged in. In the hypothetical condition disengagement beliefs were handled by asking what-if questions. This type of questions encourages participants to reason hypothetically: they have to reconsider the validity of their disengagement beliefs. In the non-hypothetical condition DBs were handled by providing one or two evidence-based arguments. In the control group condition disengagement beliefs were not handled. The main research question of this study was:

Does handling disengagement beliefs with evidence-based (non-hypothetical) counterargumentation lead to a bigger effect in the intention of omnivores to reduce their consumption of animal nutrition products than giving what-if counterargumentation?

To examine this question, the intention scores for the hypothetical and the non-hypothetical condition were compared with each other, using a Repeated Measures Analysis of Variance. Results of this analysis are discussed in paragraph 4.5.1, 4.5.2, and 4.5.3.

Before I discuss these findings, one other striking result from this study should be discussed as well. It appeared that exposure to the intervention led to a significant increase in the behavioural subtypes that involve a reduction in the amount of animal nutrition (eating plant-based, eating vegetarian, and reducing portion sizes of meat). The condition or gender of the participants did not play a role in this increase.

One possible explanation for this effect is that the exposure to the intervention already helped increase the salience of certain dissonant cognitions that were already present within the participants’ existing cognitions. In other words: the exposure to the intervention served as a reminder of people’s internal “meat paradox” (Loughnan, Bastian & Haslam; 2010). The resulting aversive state might in turn have motivated people to adapt their behaviour.

However, considerable differences in intention between the two experimental conditions were also found. For example, intention scores for eating plant-based and eating vegetarian were significantly higher for participants in the hypothetical condition than for those in the non-hypothetical condition. Based on these results it appears that the opposite of my predictions is true: handling disengagement beliefs with hypothetical counterargumentation led to a bigger effect in the intention of omnivores to reduce their consumption of animal nutrition products than handling them with non-hypothetical counterargumentation.

In the next part of this paragraph I will discuss the three alternative hypotheses.

- H1: Interventions which tailor information on specific disengagement beliefs have a bigger effect on behavioural intention than interventions that do not handle these disengagement beliefs.
In order to test this hypothesis the two conditions that used the technique of disengagement belief handling (the hypothetical and the non-hypothetical condition) were combined into the new variable ‘DBH Condition’. They were then compared with the condition that did not use this technique (the control group). The results from this analysis can be found in paragraph 4.5.4.

These results suggest that the incorporation of DBH into the interventions has only resulted in a significantly higher behavioural intention to eat vegetarian. The other subtypes of behavioural intention did display a tendency towards reducing the share of animal nutrition in one’s diet (increase in intention to eat plant-based and intention to reduce the portion sizes of meat; decrease in intention to eat normal portion sizes of meat). However, these results did not differ significantly from the non-DBH condition (i.e. the control group condition). Furthermore, Self-efficacy scores were marginally higher in the DBH conditions than in the non-DBH condition. Based on these results it can be concluded that the null-hypothesis can be rejected: including DBH in MI-based dialogue systems appears to have a relatively small, but meaningful effect in persuading people to switch to a (more) plant-based diet.

- H2: Participants in the non-hypothetical conditions will display lower perceived autonomy-, and higher counterarguing scores than participants in the hypothetical condition.

An ANOVA was carried out to determine the effects of condition on the evaluation variables. No significant differences between the counterarguing and perceived autonomy scores of the various conditions were found. One significant interaction effect of sex and condition was found: compared to the control group, women in the hypothetical condition displayed stronger agreement with the statement “I have received new information on a (more) plant-based diet during the conversation with [Laura/ Marc]” (PC1).

Overall it therefore appears that the type of DBH had a negligible effect on psychological needs, and no effect on counterarguing scores. Based on these findings I can conclude that the intervention has performed relatively equal across all three conditions, with regards to catering to the psychological needs. The null hypothesis (“Participants in the non-hypothetical condition will not display any differences in counterarguing or perceived autonomy scores, compared to participants in the hypothetical condition”) can thus be accepted.

- H3: Same gender conversations will have a more positive effect on participants’ basic psychological needs than mixed gender conversations.

To test this hypothesis, a Univariate Analysis of Variance on the evaluation variables was executed. The analysis revealed no main effects of Avatar choice. Only one marginally significant interaction effect (Sex x Avatar) was found: men who had chosen Marc scored marginally higher on PR than men who had chosen Laura. Apparently they felt like Marc had given them more new information than those who had had a conversation with Laura. However, since this result is only marginally significant, it can be neglected. It therefore appears that the gender of the avatar did not influence participants’ psychological needs. In conclusion, the null hypothesis (“Same gender conversations will have no different effect on participants’ psychological needs than mixed gender conversations”) can be accepted.

6. Discussion

When interpreting the results from the current study a number of limitations should be taken into account. These limitations and suggestions for improvements and future research are discussed in this section. Respondent feedback on the intervention was coded by the researcher and served as a basis for some of these recommendations.
6.1 Experimental design
After each block in the tailoring module the intervention asked the participants whether they would be willing to consume more plant-based nutrition, instead of animal nutrition. Those who indicated that they were receptive towards this behavioural change were redirected to the General conclusion block. This was done, since exposure to the following experimental stimuli would probably still result in the same answer for the following question(s) in the tailoring module.

One limitation of this experimental design is that it cannot be ruled out whether certain participants were already more open to the desired behaviour, even before being exposed to the information in the tailoring module. Outcome variables such as attitude, self-efficacy, and motivation were only tested after exposure to the experimental manipulation. One way to overcome this obstacle is by using a pretest-posttest design for the outcome variables. However, according to Baxter & Babbie (2004: p.207) a potential risk of using this type of experimental design for the outcome variables is that a testing effect might occur: any changes that occur in the posttest might be due to the fact that the respondent has gotten more sensitive to the issue by answering the questions in the beginning. It was therefore decided to conduct only posttests on the behavioural outcome variables. Another reason for choosing this design is that a pre-assessment of these variables simply would not fit within the process of MI.

Another limitation of this design is that most people in the experimental conditions were exposed to only one or two DBH blocks, and not to the value domain block. People in the control group conditions were only exposed to the value domain block. As a result, the experimental manipulation was relatively minimal. It would therefore be advisable to expose all participants in the experimental conditions to the same sequence of blocks, instead of redirecting certain participants out of the module. Perhaps this would lead to even bigger effect sizes.

6.2 Intervention duration
A pretest revealed that many participants took over 20 minutes to complete the concept version of the intervention. However, Baxter and Babbie (2004: p.198) recommend limiting study length to a maximum of 15 minutes per participant. A longer duration could scare off potential participants and could be a risk factor for respondent fatigue. To substantially shorten the length of the dialogue to ten to fifteen minutes a number of adaptations were made.

One of these modifications was to reduce the number of items used to measure the dependent variables. I have chosen to adhere to a maximum of two items per variable. This might have negatively influenced the internal consistency reliability of the questions. However, in my opinion this low number of items was a necessary measure to compromise between research accuracy and the overall attractiveness of the intervention. The informational texts used for DBH in the non-hypothetical and the control group condition were already substantially shortened in length. I believe that any further reductions in length would have negatively influenced the quality of the intervention.

However, it is still difficult to determine to what extent respondents felt comfortable with the intervention duration. I can only speculate about the motives people had for not finishing the intervention. One explanation could be that they still felt discouraged by the length of the intervention. Another explanation could be that the communication style of the intervention did not appeal to them or that they simply did not feel a need to change.

Furthermore, it is still not possible to determine how much time participants exactly needed for finishing the dialogue. The program used for devising the intervention, Qualtrics, only measures the total duration in seconds, without specifying ‘pause time’. The program also enables participants to save their progress and continue later on. Intervention duration therefore showed considerable variability, ranging from five minutes to over five days. It
Therefore seems unlikely that all participants completed the intervention in one continuous session, without having any breaks.

As such, in the present version of the intervention respondent feedback serves as the most reliable indication of participants’ perception of the duration. 1,9 % of respondents (N=3) indicated that, in their opinion, they had to read too much text. They therefore did not fully read the text. This seems to be an acceptable number, but the limitations mentioned earlier should be taken into account when interpreting these results. Perhaps adding items that assess participants’ perception of the intervention duration could give a more reliable impression.

6.3 Heuristic principles
The images of the avatars might have subconsciously influenced participants’ perception of the conversation through heuristic cues (e.g. liking; O’Keefe, 2002). In a pretest by Hagen (2016) her respondents indicated that they felt a drawing of an avatar was too unrealistic and unattainable. Following these recommendations, a picture of a real woman (’Laura’) was therefore also used in the present intervention. It was another picture than the one employed by Hagen. In addition to this, a male avatar, ‘Marc’, was included. This was done in order to reduce the chance of a possible gender bias. It was also hoped that this choice option would reinforce participants’ perceived autonomy.

Although it was attempted to select pictures of people with similar physical traits, a substantial number of people preferred a conversation with Laura over one with Marc. It is unclear what motivated people to make this choice. Perhaps Laura’s image made a more appealing or reliable first impression than Marc’s. One other possible explication could be that gender indeed influenced people’s perception of the following conversation. However, no significant main effects of avatar choice on any of the outcome variables were found. It therefore seems unlikely that these heuristic cues have influenced people’s perception.

6.4 Choice options
The present intervention was the first one within the CoCo-research to employ the 4N-scale by Piazza et al. (2015) as a basis for the assessment of disengagement belief endorsement. Piazza et al. state that the 4N-scale accounts for 83 to 91% of the rationalizations people use for justifying their meat consumption. However, ten people suggested in their feedback that their arguments for eating meat did not fit within Piazza et al.’s classification (the disengagement belief endorsement question). They indicated that they felt irritated by this. Respondents’ financial situation, habit, active lifestyle, the consumption of biologically grown meat, and pressure from family members were all mentioned as justifications to eat meat.

It appears that a few more topics should be included in the intervention to better capture the complexity of factors underlying people’s consumption of animal proteins. Perhaps future researchers could pretest the statements to explore what other disengagement beliefs people endorse, beside the 4N-statements.

Especially an item assessing perceived norm appeared to be missed by most respondents. I did not include an assessment of this variable in the intervention, since it is not one of the main outcome variables of MI. The intervention was mostly aimed at influencing people’s attitude towards the desired behaviour, rather than their perceived norm. Furthermore, in my opinion participants were offered an option to use social norm as a justification, by means of the ‘Normal’ DBs. However, three respondents indicated that they missed an option to provide this as a justification for their behaviour. Social pressure from family members and friends was an important factor for their current behaviour. Examples of responses were: “One person in a family could want to eat vegan, but if the rest wants meat and does not listen to the arguments it will not work” and “I don’t think it is difficult to eat less meat, but my husband expects a nice meal with a piece of meat after a long day of work”. It
would therefore be advisable to incorporate an assessment of perceived norm as well in future versions of similar interventions.

6.5 Balanced reporting
Although counterargumentation scores did not appear to be very high in both the non-hypothetical and the control group condition, several respondents stated that they felt the intervention was directing them towards a certain opinion. They said the intervention was too focused on the disadvantages of eating meat, and the advantages of consuming plant-based nutrition. One respondent said: “I thought it [the conversation, red.] was quite directive. Plant-based was amazing and meat, regardless of quantity, was not good. I disagree with the part that every livestock farm harms animals (bio farms and grazing cows).” Another one said: “I hate being ‘directed’. Everything is aimed at changing the eating pattern, while I do not feel the need to do so. I believe my diet is healthy; lots of fruit, vegetables, fibers, small amounts of sugar and salt. That’s not what this is about. I feel mislead.” Perhaps participants would feel less directed if the intervention would pay more attention to pro-meat arguments (e.g. availability, the time it takes to get used to a new diet, et cetera).

6.6 Directions for future studies
The current study suggests a number of directions for future studies on the field of MI-based dialogue systems. For example, the present study involved only one contact moment with the intervention. However, Noar, Benac & Harris (2007) found that print tailored interventions that utilized two or more intervention contacts led to stronger changes in health behaviour than those who utilized only one contact moment. Perhaps the same would be true for the CoCo-interventions.

Furthermore, Noar, Benac & Harris (2007: p.689) also state that interventions that include concepts such as stages of change, or processes of change yield stronger behavioural changes than those that don’t. Maybe it would also be interesting to tailor information on these concepts in future versions of CoCo-interventions.

And finally, one of the most important limitations of these and earlier versions of CoCo-interventions is the fact that they are unable to interpret answers to open questions. It would be interesting to explore the effects of asking open questions, since it is one of the core skills of motivational interviewing (Miller & Rollnick, 2013: p.33). One method that does enable asking open questions is Computer Assisted Telephone Interviewing (CATI). With this method, an interviewer can ask questions via the phone, while following a script provided by a computer. It would be interesting to explore whether this method would yield different results than computer-delivered interventions.

References


**Online sources**


Appendix A: Intervention design

General information:
- The chosen avatar will be displayed in every following window.
- Participants are always redirected to the next question, unless stated otherwise (see: red texts).
- In multiple choice questions in which item order is irrelevant the items are displayed in random order.
- Participants are forced to respond in all questions, except for the ‘text box’-questions.

Legend:

<table>
<thead>
<tr>
<th>Question</th>
<th>Hypothetical</th>
<th>Non-hypothetical</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Text between quotation marks”</td>
<td></td>
<td></td>
<td>Avatar</td>
</tr>
<tr>
<td><strong>Italicized text</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Green</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BLUE TEXT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>[Red text]</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>[Orange text]</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>[Orange cursive text]</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Question numbers
- Q[number]: Question number
- T[number]: Question number (text only; no interaction possibility)

Hypothetical

Q1 AVATAR

“Hallo, wij zijn *Marc* en *Laura*. We zouden graag met je willen praten over je eetpatroon. Met wie van ons wil jij het liefst praten?”

[Chosen avatar is pictured in every following window]

T2 INTRODUCTION
“Fijn dat je mij hebt gekozen!

Voordat we met elkaar in gesprek gaan, moet je weten dat al je antwoorden **volledig anoniem** behandeld worden! Het gesprek zal ongeveer 10 tot 15 minuten duren. Daar staat tegenover dat je met deze vragenlijst kans kunt maken op één van de tien Bol.com tegoedbonnen t.w.v. 10 euro. De code die je straks na het beantwoorden van de vragen op kunt sturen is niet naar jouw antwoorden te herleiden!

Voor we echt beginnen wil ik graag nog een paar algemene zaken van je weten.”

### Demographic information

<table>
<thead>
<tr>
<th>Q3</th>
<th>SEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Wat is je geslacht?”</td>
<td></td>
</tr>
<tr>
<td>[Multiple choice]</td>
<td></td>
</tr>
<tr>
<td>Man</td>
<td></td>
</tr>
<tr>
<td>Vrouw</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q4</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>“En wat is je leeftijd?”</td>
<td></td>
</tr>
<tr>
<td>[Text box ‘age’]</td>
<td></td>
</tr>
</tbody>
</table>

[Participants younger than 18 are redirected to T6: ‘End (too young)’]

<table>
<thead>
<tr>
<th>Q5</th>
<th>EDUCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Kun je me verder nog vertellen wat je hoogst afgereonde opleiding is?”</td>
<td></td>
</tr>
<tr>
<td>[Multiple choice]</td>
<td></td>
</tr>
<tr>
<td>Lagere school/basisonderwijs</td>
<td></td>
</tr>
<tr>
<td>Lbo, vbo, lts, lhno, vmbo</td>
<td></td>
</tr>
<tr>
<td>Mavo, vmbo-t, mbo-kort</td>
<td></td>
</tr>
<tr>
<td>Mbo, mts, meao</td>
<td></td>
</tr>
<tr>
<td>Havo, vwo, gymnasiun</td>
<td></td>
</tr>
<tr>
<td>Hbo, heao, pabo, hts</td>
<td></td>
</tr>
<tr>
<td>Wo-bachelor of -master</td>
<td></td>
</tr>
<tr>
<td>Anders, namelijk: [text box]</td>
<td></td>
</tr>
</tbody>
</table>

[Participants redirected to Q7: ‘Current behaviour’]

<table>
<thead>
<tr>
<th>T6</th>
<th>END (TOO YOUNG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Je valt helaas niet binnen de leeftijdscategorie van 18 jaar of ouder. Helaas kom jij daarom niet in aanmerking voor verdere deelname aan dit gesprek. Ik wil je toch bedanken voor je bereidheid om mee te werken aan dit onderzoek!”</td>
<td></td>
</tr>
</tbody>
</table>

[End of survey]
“Gemiddeld hoeveel dagen in de week heb je tijdens de afgelopen maand de onderstaande eetpatronen aangehouden? Het gaat hier om de gehele dag, dus zowel bij het ontbijt, als bij de lunch en bij het avondeten. Het totale aantal dagen moet gelijk zijn aan ‘7’.”

(Constant sum question; total sum must equal ‘7’)
Ik eet op dit moment gemiddeld [...] dagen in de week volledig plantaardig.
Ik eet op dit moment gemiddeld [...] dagen in de week volledig vegetarisch.
Ik eet op dit moment gemiddeld [...] dagen in de week bewust kleinere porties vlees dan gewoonlijk.
Ik eet op dit moment gemiddeld [...] dagen in de week normale porties vlees.

Q8 DIET REMARKS

“En zijn er eventueel nog bijzonderheden met betrekking tot je dieet (bijvoorbeeld allergieën of religieuze voorschriften)?”

[Text box]

[Participant who have indicated that they eat plant-based or vegetarian 7 days per week in Q7 are redirected to T9: ‘End (participant vega(n))’]
[All other participants are redirected to Q10: ‘Permission request’]

T9 END (PARTICIPANT VEGA(N))

“Je hebt al een volledig vegetarisch of veganistisch eetpatroon. Helaas kom jij daarom niet in aanmerking voor verdere deelname aan dit gesprek. Ik wil je toch bedanken voor je bereidheid voor je bereidheid om mee te werken aan dit onderzoek!”

[End of survey]

Q10 PERMISSION REQUEST

“In dit programma wil ik met je in gesprek gaan over de voordelen van een meer plantaardig eetpatroon, dus met minder vlees, vis, of andere dierlijke producten. Het is voor mij belangrijk dat je zelf besluit waar je wel of niet over wilt praten.

Wat vind je er dus van als we het gaan hebben over je eetpatroon, en mogelijke veranderingen daarin?”

[Multiple choice]
Ik geef wel toestemming om het over mijn eetpatroon te hebben.
Ik geef geen toestemming om het over mijn eetpatroon te hebben.

[If participants select the ‘no permission’ option, they are redirected to Q11: ‘No permission: reason’]
[If participants select the ‘permission’ option, they are redirected to T14: ‘Permission’]

Q11 NO PERMISSION: REASON
“Jammer, maar ik respecteer natuurlijk je keuze! Zou je me kort kunnen uitleggen wat maakt dat je er niet over wilt praten?”

Q12

NO PERMISSION: FEEDBACK

“En heb je misschien nog opmerkingen of suggesties naar aanleiding van dit onderzoek?

[Text box]

T13

NO PERMISSION: WINCODE & END

“Jouw wincode: ‘Plant2017’

Stuur jouw wincode uiterlijk vrijdag 7 juli 2017 naar 2050food@gmail.com. Je kunt zo kans maken op één van de tien Bol.com tegoedbonnen ter waarde van tien euro! Het opgegeven e-mailadres zal alleen gebruikt worden voor de bekendmaking van de winnaars. Nogmaals: de code kan niet naar jouw antwoorden herleid worden. Je antwoorden worden dus volledig anoniem behandeld!

Ik vond het in ieder geval leuk met je gepraat te hebben. Bedankt voor je medewerking!”

[End of survey]

Permission: Yes

T14

PERMISSION

Mooi! Leuk om met je in gesprek te gaan! Laten we beginnen…

Value domain endorsement

Q15

VALUE DOMAIN RANKING

“Stel: je maakt een keuze op het gebied van voeding. Je bestelt bijvoorbeeld een gerecht in een restaurant of je doet boodschappen. Kun je rangschikken hoe belangrijk de onderstaande factoren op dat moment voor jou zijn?

Je kunt de volgorde veranderen door de stellingen te verslepen met je muis. ('1'=meest belangrijk, '3'=minst belangrijk). Als je de volgorde niet wilt veranderen kun je met een van de stellingen "wiebelen" (zonder hem te verplaatsen). Zo kun je doorgaan naar de volgende vraag.”

[Drag and drop ranking (1-3)]

Dat mijn voeding goed is voor het milieu.
Dat mijn voeding goed is voor het dierenwelzijn.
Dat mijn voeding goed is voor mijn gezondheid.

[VD-information in ‘T28’ will be tailored, based on value domain selected as number one in this question]

Q16

VALUE DOMAIN ADHERENCE
“Ok, je hebt net een rangschikking gemaakt. Zou je ook kunnen toelichten hoe belangrijk of onbelangrijk je de onderstaande zaken precies vindt?”

[7-point Likertscale (Very unimportant- Very important); Matrix]
Dat mijn voeding goed is voor het milieu.
Dat mijn voeding goed is voor het dierenwelzijn.
Dat mijn voeding goed is voor mijn gezondheid.

T17 INFORMATION INTRODUCTION

“Steeds meer mensen kiezen ervoor om één of meerdere dagen per week dierlijke producten te vervangen door plantaardige producten. Dat kan betekenen dat mensen geen vlees en vis eten, maar ook dat mensen daarnaast eieren en zuivel uit hun voeding weglaten.

De meeste dierlijke producten kunnen tegenwoordig vervangen worden door plantaardige varianten. Deze zijn inmiddels in bijna elke supermarkt te vinden (amandelmelk, vleesvervangers, sojayoghurt, etc.). Een plantaardig eetpatroon is verder gebaseerd op granen (brood, pasta, rijst), aardappelen, groente, fruit, peulvruchten, paddestroelen, zaden en noten.

Mensen noemen vaak gezondheid, milieu en dierenwelzijn als belangrijkste redenen om vaker plantaardig te eten. Daar zal ik kort wat meer over vertellen...”

T18 INFORMATION: HEALTH

“Gezondheid:

Zowel nationale (Stichting Voedingscentrum Nederland) als internationale instituten (American Dietetic Association) geven aan dat een volledig plantaardig eetpatroon net zo gezond kan zijn als andere voedingspatronen. Er zijn zelfs aanwijzingen dat het gezonder is om minder of helemaal geen dierlijke eiwitten te eten. Mensen hoeven in ieder geval geen voedingsstoffen tekort te komen, zoals vaak wordt gedacht.”

T19 INFORMATION: ENVIRONMENT

“Milieu:

De veeteelt is verantwoordelijk voor een groot deel van de uitstoot van broeikasgassen. De VN heeft berekend dat dat maar liefst 18% van de totale wereldwijde uitstoot is. Dat is nog meer dan de transportsector in zijn geheel (13%)! Inclusief alle bijproducten van de bio-industrie, komt dit percentage volgens sommige onderzoekers zelfs op 51%! Ook is de veehouderij de belangrijkste veroorzaker van ontbossing (voor veevoerplantages) en zorgt het voor verzuring, zoetwaterschaarste en verlies van biodiversiteit.”

T20 INFO_DIERENWELZIJN

“Dierenwelzijn:

Dieren worden in de huidige veehouderij meestal niet goed behandeld: ze zijn niet vrij en kunnen hun natuurlijke, soorteigen gedrag nauwelijks vertonen. Bovendien is er geen enkel systeem van veeteelt waarbij niet alle dieren vroegtijdig moeten worden gedood. Dat is logisch als het gaat om vlees, maar het geldt ook voor zuivel
en eieren: mannelijke dieren zijn overbodig voor de productie hiervan. Mannelijke
kuikens worden bijvoorbeeld direct nadat ze uit het ei zijn gekomen vernietigd en
mannelijke kalfjes komen in de kalvermesterij terecht."

Q21 4N RANKING

"Welke drie van deze argumenten zijn voor jou de belangrijkste redenen om vlees
tei en?

Lees de stellingen aandachtig door. Vul een '1' in bij het belangrijkste argument,
een '2' bij het op één na belangrijkste argument en een '3' bij het op twee na
belangrijkste argument."

[Ranking (text box 1-3)]

Vlees is lekker.
Vlees voegt zoveel smaak toe aan een maaltijd dat het onlogisch is om het weg te
laten.
Het best smakende eten is normaal gesproken een maaltijd met vlees (bijvoorbeeld
biefstuk, kipfilet, bacon).
Maaltijden zonder vlees zouden smakeloos en saai zijn.
Het is alleen maar natuurlijk om vlees te eten.
Het is onnatuurlijk om een plantaardig dieet te hebben.
Onze voorouders eten voortdurend vlees.
Mensen hebben van nature een behoefte aan vlees.
Het is sociaal onacceptabel om geen vlees te eten.
Het is abnormaal voor mensen om geen vlees te eten.
De meeste mensen die ik ken eten vlees.
Het is normaal om vlees te eten.
Om gezond te blijven is het noodzakelijk om vlees te eten.
Je kunt niet alle proteïnes, vitamines, en mineralen die je nodig hebt krijgen uit een
planten eten.
Mensen moeten vlees eten.
Een gezond dieet bevat op z'n minst een beetje vlees.

[4N-information in 'T24' will be tailored to DB selected as number one (only in the
experimental conditions)]
[4N-information in 'T26' will be tailored to DB selected as number two (only in the
experimental conditions)]

Q22 4N ADHERENCE

"En in welke mate vind je deze argumenten belangrijk of onbelangrijk?"

[7-point Likert scale (very unimportant- very important); top three statements from
previous question are displayed]
[DB number one]
[DB number two]
[DB number three]

T23 INTRODUCTION TAILORING MODULE

"Er zijn dus verschillende redenen om vlees te eten. Er zijn echter net zo goed
argumenten te bedenken om vaker plantaardig te eten. De invulling van dat laatste
kan enorm uiteenlopen: van een dag per week geen vlees meer eten, tot helemaal geen dierlijke voedingsmiddelen meer nuttigen.

Ik zou je graag een aantal van deze motieven voor willen leggen, om te kijken hoe jij hier tegenover staat. Het staat je natuurlijk geheel vrij om zelf te kiezen wat je hiermee doet!"

4N-DBH: Number one

<table>
<thead>
<tr>
<th>T24</th>
<th>4N-DBH 1</th>
<th>4N-DBH 1</th>
</tr>
</thead>
</table>
| "Je stelt dat [parafrase 4N-DB nummer een]. Dat is moeilijk te ontkennen! Maar wat als je erachter komt dat [desbetreffende gunstige eigenschap van vlees ook van toepassing is op plantaardige voeding]..." | "Je hebt bijvoorbeeld aangegeven dat [parafrase 4N-DB nummer een] voor jou een belangrijke reden is om wel vlees te eten. Dat is heel begrijpelijk! Toch zijn er ook een aantal argumenten te vinden die een ander geluid laten horen. Hieronder heb ik [een tweetal van deze argumenten/ zo’n argument] op een rijtje gezet:

[Informatie over de geselecteerde DB (zie: Appendix C)]" |

<table>
<thead>
<tr>
<th>Q25</th>
<th>4N-DBH 1: QUESTION</th>
<th>4N-DBH 1: QUESTION</th>
</tr>
</thead>
</table>
| "...Hoe zou je -met deze situatie in gedachten- tegenover een (meer) plantaardig eetpatroon staan?" | "Hoe sta je -met deze informatie in gedachten- tegenover een (meer) plantaardig eetpatroon?"

[Multiple choice]
Ik zou wel openstaan voor een (meer) plantaardig eetpatroon.
Ik zou niet openstaan voor een (meer) plantaardig eetpatroon.

[Respondents who have selected that they are open to a (more) plant-based diet are redirected to T30: ‘General conclusion’] |

[Respondents who have selected that they are open to a (more) plant-based diet are redirected to T30: ‘General conclusion’] |
4N-DBH: Number two

T26* 4N-DBH 2

“Je hebt daarnaast aangegeven dat [parafrase 4N-DB nummer twee]. Ook een heel begrijpelijk argument! Maar stel nou dat [de gunstige eigenschap van geselecteerde 4N-stelling ook van toepassing is op plantaardige voeding]...”

4N-DBH: 2

“Je stelt ten tweede dat [parafrase 4N-DB nummer twee]. Ik wil je echter ook graag de volgende informatie ter overweging voorleggen:

[Informatie over de geselecteerde DB (zie: Appendix C)]

Q27 4N-DBH 2: QUESTION

“Hoe zou je - met deze situatie in gedachten- tegenover een (meer) plantaardig eetpatroon staan?”

[Multiple choice]

Ik zou wel openstaan voor een (meer) plantaardig eetpatroon.

Ik zou niet openstaan voor een (meer) plantaardig eetpatroon.

[Respondents who have selected that they are open to a (more) plant-based diet are redirected to T30: ‘General conclusion’]

4N-DBH 2: QUESTION

“En hoe sta je - met deze informatie in gedachten- tegenover een (meer) plantaardig eetpatroon?”

[Multiple choice]

Ik sta wel open voor een (meer) plantaardig eetpatroon.

Ik sta niet open voor een (meer) plantaardig eetpatroon.

[Respondents who have selected that they are open to a (more) plant-based diet are redirected to T30: ‘General conclusion’]

Value domain tailoring

T28** VD INFO

“Het effect van je voeding op [waardedomein nummer een] is voor jou de allerbelangrijkste factor wanneer je je voeding selecteert. Stel: je ontdekt dat het...

VD INFO

“Je hebt eerder tijdens ons gesprek al aangegeven dat [waardedomein een] belangrijk voor jou is. Zoals je waarschijnlijk al wist hebben verschillende voedingskeuzes een verschillende invloed op je fysieke welzijn. Zo zijn er diverse onderzoeken die een verband aan lijken te tonen tussen de consumptie van dierlijke voedingsmiddelen en [negatief effect op waardedomein nummer een]. Omdat ik nieuwsgierig ben naar jouw...”
hebben van een (meer) plantaardig dieet beter is voor [waardedomein nummer een] dan je huidige dieet..."

mening wil ik je ten slotte graag een aantal van deze bevindingen voorleggen:

[Informatie over waardedomein nummer 1 (zie: Appendix D voor teksten)]

<table>
<thead>
<tr>
<th>Q29</th>
<th>VD QUESTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;...Wat zou dat voor gevolgen hebben voor je houding ten opzichte van een eetpatroon met meer plantaardige, en minder dierlijke voeding?&quot;</td>
<td></td>
</tr>
</tbody>
</table>

[Multiple choice]
Ik zou wel openstaan voor een (meer) plantaardig eetpatroon.
Ik zou niet openstaan voor een (meer) plantaardig eetpatroon.

<table>
<thead>
<tr>
<th>VD QUESTION</th>
</tr>
</thead>
</table>
| "Wat heeft deze informatie voor gevolgen voor je houding ten opzichte van een eetpatroon met meer plantaardige, en minder dierlijke voeding?"

[Multiple choice]
Ik sta wel open voor een (meer) plantaardig eetpatroon.
Ik sta niet open voor een (meer) plantaardig eetpatroon.

Conclusion and intermezzo

T30
GENERAL CONCLUSION

"Hoe het ook zij, het is heel goed mogelijk om fit en gezond te blijven met een (meer) plantaardig dieet! Het heeft bovendien diverse voordelen, onder andere op het gebied van milieu, gezondheid en dierenwelzijn. Maar ik begrijp uiteraard ook wel dat het eten van vlees, melk en eieren ook zo zijn voordelen heeft ;)"

T31
INTERMEZZO

"We zijn al een tijdje in gesprek. Hou je het nog een beetje vol? Ik zou graag nog een aantal vragen aan je willen stellen..."

Q32
ATTITUDE

"We hebben het net gehad over een aantal gevolgen van een (meer) plantaardig eetpatroon. Hoe zou jij er zelf tegenover staan als er in Nederland meer en vaker plantaardig gegeten zou worden?"

[7-point semantic differential (Very negative - Very positive)]

Q33
MOTIVATION

"Zou je een cijfer kunnen geven voor je motivatie om vaker plantaardige voedingsmiddelen te gaan eten, in plaats van dierlijke? (0 = helemaal geen motivatie, 10 = zeer hoge motivatie)"

[11-point Likertscale (0=Absolutely no motivation - 10= Very high motivation)]
<table>
<thead>
<tr>
<th>T34</th>
<th>MOT0</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Je geeft aan dat je motivatie om je eetpatroon aan te passen 0 is. Dat vind ik jammer, maar ik respecteer natuurlijk je beslissing! Ik wil je toch vragen om nog een laatste paar vragen te beantwoorden.”</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T35</th>
<th>MOT1-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Het lijkt erop dat het verminderen van de hoeveelheid dierlijke producten in je eetpatroon voor jou geen hele hoge prioriteit heeft. Maar je hebt ook geen 0 gescoord!”</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T36</th>
<th>MOT4-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Het lijkt erop dat het verminderen van de hoeveelheid dierlijke producten in je eetpatroon niet heel erg belangrijk voor je is, maar ook zeker niet onbelangrijk!”</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T37</th>
<th>MOT7-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Jouw motivatie om te veranderen is heel hoog!”</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q38</th>
<th>SELF-EFFICACY</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Zou je nog een cijfer van 0 tot 10 kunnen geven voor het vertrouwen in je eigen vermogen om meer en vaker plantaardig te gaan eten? (0=helemaal geen vertrouwen, 10=zeer veel vertrouwen)”</td>
<td></td>
</tr>
</tbody>
</table>

[11-point Likert scale (0=Absolutely no confidence - 10= very high confidence)]

<table>
<thead>
<tr>
<th>T40</th>
<th>SE4-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Het lijkt erop dat je er niet veel vertrouwen in hebt dat je je eetpatroon kunt veranderen! Wat zou je kunnen helpen om er meer vertrouwen in te krijgen?”</td>
<td></td>
</tr>
</tbody>
</table>

[Text box]
"Ik zie dat je best enig vertrouwen hebt in het veranderen van je eetpatroon!"

[Participants are redirected to Q42: ‘Intention’]

T41

SE7-10

“Goed dat je zelfvertrouwen zo hoog is!”

[Participants are redirected to Q42: ‘Intention’]

Q42

BEHAVIOURAL INTENTION

“Hoeveel dagen in de week zou je in de toekomst de onderstaande eetpatronen aan willen gaan houden? Het gaat hier om de gehele dag, dus zowel bij het ontbijt, als bij de lunch en bij het avondeten. Het totale aantal dagen moet gelijk zijn aan ‘7’.”

[Constant sum question; total sum must equal ‘7’]

Ik wil [...] dagen in de week volledig plantaardig gaan eten.
Ik wil [...] dagen in de week volledig vegetarisch gaan eten.
Ik wil [...] dagen in de week bewust kleinere porties vlees dan gewoonlijk gaan eten.
Ik wil [...] dagen in de week normale porties vlees blijven eten.

Q43

INTENTION: TIME FRAME

“En binnen welk tijdsbestek ga je dit veranderde eetpatroon toepassen?”

[Multiple choice]

* Binnen een week
* Tussen twee en vier weken
* Tussen twee en drie maanden
* Tussen vier maanden en een jaar
* Niet van toepassing

[Participants who have selected ‘Binnen een week’ or ‘Tussen twee en vier weken’ are redirected to T44: ‘Time frame: short’]
[Participants who have selected ‘Tussen twee en drie maanden’ or ‘Tussen vier maanden en een jaar’ are redirected to T45: ‘Time frame: long’]
[Participants who have selected ‘Niet van toepassing’ are redirected to Q46: ‘Evaluation’]

T44

TIME FRAME: SHORT

“Dat is al snel! Goed om te horen!”

[Participants are redirected to Q46: ‘Evaluation’]

T45

TIME FRAME: LONG

‘Je wacht liever wat langer. Helemaal niet erg! Ik begrijp dat het niet makkelijk is om binnen een maand je eetpatroon al zo te veranderen. Veel mensen beginnen langzaamaan met het afbouwen van het aandeel dierlijke producten in hun dieet.’

[Participants are redirected to Q46: ‘Evaluation’]
### Q46 EVALUATION

“Ten slotte heb ik nog een aantal vragen over wat je van het gesprek met mij vond. Zou je aan willen geven in hoeverre je het eens of oneens bent met de volgende stellingen over mij?”

[7-point Likert scale (1=Strongly disagree - 7= Strongly agree); Matrix]

<table>
<thead>
<tr>
<th>Laura/Marc</th>
<th>Heeft mij geholpen bij het vormen van mijn eigen ideeën als het om mijn eetpatroon gaat.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[Laura/Marc] ging er vanuit dat ik degene ben die het meest weet over mezelf.</td>
</tr>
<tr>
<td></td>
<td>Ik had het idee dat [Laura/Marc] rekening hield met mijn eigen situatie.</td>
</tr>
<tr>
<td></td>
<td>Ik heb tijdens het gesprek met [Laura/Marc] nieuwe informatie ontvangen over een</td>
</tr>
<tr>
<td></td>
<td>(meer) plantaardig eetpatroon.</td>
</tr>
<tr>
<td></td>
<td>[Laura/Marc] heeft me geholpen bij het maken van plannen om vaker plantaardig</td>
</tr>
<tr>
<td></td>
<td>te eten.</td>
</tr>
<tr>
<td></td>
<td>Ik voelde soms de behoefte om [Laura/Marc] tegen te spreken.</td>
</tr>
<tr>
<td></td>
<td>Ik was op zoek naar fouten in [Laura/Marc]’s verhaal.</td>
</tr>
</tbody>
</table>

### Q47 FEEDBACK

“En heb je misschien nog opmerkingen over of suggesties voor dit onderzoek?”

[Tekst box]

### T48 WINCODE

“Dankjewel voor je feedback! Jouw wincode is ‘Food2017’

Stuur jouw wincode uiterlijk vrijdag 7 juli 2017 naar 2050food@gmail.com. Je kunt zo kans maken op één van de tien Bol.com tegoedbonnen ter waarde van tien euro! Het opgegeven e-mailadres zal alleen gebruikt worden voor de bekendmaking van de winnaars. Nogmaals: de code kan niet naar jouw antwoorden herleid worden. Je antwoorden worden dus volledig anoniem behandeld!

Ik vond het in ieder geval leuk met je gepraat te hebben. Bedankt voor je medewerking!”

[End of survey]
### Appendix B: List of experts consulted for fact check information texts

<table>
<thead>
<tr>
<th>Name</th>
<th>Specialism</th>
<th>Fact checked text(s)</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jay J. van Cleef, pHd</td>
<td>Biotechnology/ pHd Healthcare intelligence marketing, Hanze University of Applied Sciences.</td>
<td>• VD: Health</td>
<td><a href="mailto:J.j.van.cleef@pl.hanze.nl">J.j.van.cleef@pl.hanze.nl</a></td>
</tr>
<tr>
<td>Dr. ir. Sanderine Nonhebel</td>
<td>Associate professor Environmental sciences, University of Groningen.</td>
<td>• VD: Environment</td>
<td><a href="mailto:S.nonhebel@rug.nl">S.nonhebel@rug.nl</a></td>
</tr>
<tr>
<td>Lisa Steltenpool</td>
<td>Dietician (specialized in plant-based nutrition).</td>
<td>• 4N: Necessary • VD: Health</td>
<td><a href="mailto:Steltenpool.lisa@gmail.com">Steltenpool.lisa@gmail.com</a></td>
</tr>
<tr>
<td>Willem B. Vermaat, MSc</td>
<td>Lecturer Environmental Sciences (specialized in animal ethics), University of Utrecht.</td>
<td>• VD: Animal welfare</td>
<td><a href="mailto:W.B.Vermaat@uu.nl">W.B.Vermaat@uu.nl</a></td>
</tr>
<tr>
<td>Renée Baris</td>
<td>Ma. Student Animal Sciences, University of Wageningen</td>
<td>• VD: Animal welfare • VD: Health • VD: Environment</td>
<td><a href="mailto:Renee.baris@gmail.com">Renee.baris@gmail.com</a></td>
</tr>
</tbody>
</table>
Appendix C: Information texts - Disengagement Beliefs

A. Nice

NICE 1: Vlees is lekker.
- Mensen die er voor kiezen om plantaardig te eten doen dat meestal niet omdat ze vlees niet lekker vinden. Integendeel zelfs! De langetermijnvoordelen van een (meer) plantaardig eetpatroon wegen voor hen echter veel zwaarder dan de kortstondige voldoening van een stuk vlees.
- Een goed bereide plantaardige maaltijd kan net zo smakelijk zijn als een maaltijd met vlees.

NICE 2: Vlees voegt zoveel smaak toe aan een maaltijd dat het onlogisch is om het weg te laten.

NICE 3: Het best smakende eten is normaal gesproken een maaltijd met vlees (bijvoorbeeld biefstuk, kipfilet, bacon).
- Tegenwoordig is er voor vrijwel elk dierlijk product wel een plantaardige vervanger te vinden, die bovendien in iedere supermarkt te koop is.

NICE 4: Maaltijden zonder vlees zouden smakeloos en saai zijn.
- Plantaardige voedingsmiddelen hebben een enorme variatie in smaken, geuren, kleuren en structuren. Denk maar eens aan rode wijn, maisbrood, bananen, olijven, kerrieoeder, wortels en walnoten. Totaal verschillende producten en toch geheel plantaardig! Met een beetje experimenteren kun je er vanzelf achter komen wat er allemaal mogelijk is op het gebied van plantaardig eten.

B. Normal

NORMAL 1: Het is sociaal onacceptabel om geen vlees te eten.
- Uit vrijwel alle bevolkingsonderzoeken blijkt dat er in Nederland steeds minder vlees gegeten wordt. Mensen die nog elke dag vlees eten zijn zelfs in de minderheid: slechts een op de zeven Nederlanders doet dat nog.

Meer dan de helft van de bevolking eet inmiddels minstens drie dagen per week geen vlees. De kans is dus groot dat er ook in jouw kennisring mensen zijn die een of meerdere dagen in de week een vleesloze of plantaardige dag hebben.

**NORMAL 2: Het abnormaal voor mensen om geen vlees te eten.**
- Tegenwoordig zijn er steeds meer (inter)nationale instanties die mensen juist aanmoedigen om minder vlees en andere dierlijke producten te eten. Dit advies komt omdat er steeds meer bekend wordt over de nadelige effecten van de consumptie van dierlijke voedingsmiddelen.
- Onder de voorstanders van een vermindere vleesconsumptie bevinden zich onder andere de Wereldgezondheidsorganisatie, de Verenigde Naties en het Rijksinstituut voor Volksgezondheid en Milieu.

**NORMAL 3: De meeste mensen die ik ken eten vlees.**
- Maar eten deze mensen ook elke dag vlees? Veel mensen die niet dagelijks vlees eten noemen zichzelf namelijk niet altijd expliciet flexitariër.
- Aan de andere kant voelen ruim vier op de tien Nederlanders zich bezwaard om aan te geven dat ze liever geen vlees eten. Misschien helpt het dus al om het onderwerp aan te kaarten. Plantaardig of vegetarisch eten kan soms ook een welkom afwisseling zijn voor je naaste omgeving.

**NORMAL 4: Het is normaal om vlees te eten.**
- Voordat we wisten hoe ongezond roken was vonden we het ook heel normaal dat bijna iedereen rookte. Niet-rokers werden zelfs voor gek versleten.
- De afgelopen jaren zijn mensen zich meer bewust geworden van de nadelige gevolgen van het eten van vlees en andere dierlijke producten. En dat zijn er nog veel meer dan bij roken! Zodoende zijn we in Nederland al steeds minder vlees gaan eten: gemiddeld aten we er in 2015 per persoon al vijf kilo minder van dan tien jaar daarvoor, in 2005.

---

C. Natural

NATURAL 1: Het is alleen maar natuurlijk om vlees te eten.
- Het menselijk lichaam is bijzonder goed in staat om de voedingsstoffen uit plantaardige producten op te nemen. Zo hebben mensen -net als herbivoren- relatief kleine tanden, platte kiezen en lange darmen. Daarnaast zijn het speeksel en het maagzuur van mensen veel minder zuur dan dat van pure carnivoren.
- We krijgen tegenwoordig zo onnatuurlijk veel dierlijke eiwitten binnen dat het eerder schadelijke dan positieve gevolgen heeft.

NATURAL 2: Het is onnatuurlijk om een plantaardig dieet te hebben.
- Onze voeding bevat doorgaans veel suikers, conserveermiddelen en kleur-, geur- en smaakstoffen. Dat is ook niet natuurlijk.
- Door onze lichaamsbouw kunnen we onze voedingsstoffen uit zowel dierlijke als uit plantaardige voedingsmiddelen halen. Ook met een plantaardig dieet kunnen we alle benodigde voedingsstoffen binnenkrijgen.

NATURAL 3: Onze voorouders aten voortdurend vlees.
- Vroeger was vlees voor onze voorouders in tijden van schaarste een handig overlevingsmiddel, omdat het rijk was aan energie. Tegenwoordig zijn we door het enorme aanbod in de supermarkt echter al lang niet meer afhankelijk van “wat er voor handen is”.
- We weten tegenwoordig precies in welke hoeveelheden we bepaalde stoffen nodig hebben en uit welke plantaardige bronnen we die essentiële voedingsstoffen ook kunnen halen.

NATURAL 4: Mensen hebben van nature een behoefte aan vlees.
- De meeste mensen hebben tegenwoordig als ze een koe, een kip of een varken zien niet meteen zin om het te doden en hun tanden erin te zetten. Niet voor niets wordt vlees in Nederland zoveel mogelijk ontdaan van de associatie dat het ooit een levend wezen met emoties en intelligentie is geweest.

D. Necessary

NECESSARY 1: Om gezond te blijven is het noodzakelijk om vlees te eten.
- Om gezond te blijven kun je prima ijzer, eiwitten en vitamine B12 uit plantaardige bronnen halen 9.
- Er zijn bovendien nogal wat aanwijzingen dat er een verband bestaat tussen een verminderde inname van dierlijke eiwitten en een verbeterde gezondheid. Zo zou een meer plantaardig eetpatroon onder andere de kans op hart- en vaatziekten, diabetes type-2, kanker en obesitas kunnen verminderen 10.

NECESSARY 2: Je kunt niet alle proteïnes, vitamines, en mineralen die je nodig hebt krijgen uit een plantaardig dieet.
- Op vitamine B12 na kun je alle voedingsstoffen uit dierlijke voedingsmiddelen (zink, jodium, ijzer, eiwitten, calcium, omega-3 en vitamine D en B2) ook uit plantaardige

producten halen. Omdat vitamine B12 door bacteriën wordt gemaakt is het ook verkrijgbaar in supplementvorm.

NECESSARY 3: Mensen moeten vlees eten.
- Het hebben van een gevarieerd en (meer) plantaardig voedingspatroon zal je fysieke en intellectuele prestaties niet benadelen. Olympische goudenmedaillewinnaar Carl Lewis, Oscarwinnaar James Cameron en tennissster Venus Williams eten bijvoorbeeld uitsluitend plantaardige voeding.

NECESSARY 4: Een gezond dieet bevat op z’n minst een beetje vlees.
- Mensen hebben niet per se vlees of andere dierlijke voedingsmiddelen nodig om gezond te blijven. Zowel het Voedingscentrum als de Amerikaanse Academy of Nutrition and Dietetics (AAND) stellen dat een gevarieerd vegetarisch of veganistisch dieet gezond is en voldoende voedingsstoffen bevat. Beide eetpatronen zijn volgens de AAND gepast voor “alle levensfases, inclusief zwangerschap, kindertijd, pubertijd, volwassenheid en voor sporters”.

---

Appendix D: Information texts - Value domains

A. Environment

Broeikasgassen
- Vee is naast CO\(_2\) verantwoordelijk voor een groot deel van methaangas en distikstofoxide, stoffen die op korte termijn vele tientallen malen meer warmte vasthouden dan CO\(_2\) \(^{16,17}\). Als alle inwoners van de Europese Unie hun consumptie van vlees, zuivel en eieren halveren daalt de uitstoot van broeikasgassen met 25 tot 40 procent \(^{18}\).

Landgebruik
- Voor de productie van een kilo eetbaar rundvlees is volgens een conservatieve schatting 25 kg plantaardig voer nodig \(^{19}\). Tot wel 91 procent van al het regenwoud dat gekapt wordt in de Amazone is vanwege de veehouderij en het kweken van veevoer \(^{20}\). Ongeveer driekwart van de wereldwijde sojateelt is bestemd voor dieren in de landbouw \(^{21}\).

Waterverbruik
- Qua waterverbruik staat het eten van een hamburger van 100 gram gelijk aan een maand lang elke dag douchen (ca. 1500 liter) \(^{22,23}\). Ter vergelijking: om 100 gram groenten te produceren is ongeveer 32 liter zoet water benodigd, voor fruit 96 liter en voor granen is dat 164 liter \(^{24}\).

B. Animal welfare

Gezondheid
- Dieren in de veehouderij hebben vaak last van gezondheidsproblemen die het gevolg zijn van hun leefomgeving en van het feit dat ze zo ver doorgefokt zijn. Loopproblemen en ontstekingen zijn bijvoorbeeld veelvoorkomende aandoeningen. Bovendien gaan dieren in de gangbare veehouderij onnatuurlijk en agressief gedrag naar elkaar toe vertonen omdat ze dicht op elkaar leven.


Emotie en intelligentie

Dierenlevens
Een vegetarische Nederlander spaart in zijn of haar leven, exclusief vis, gemiddeld 727 dierenlevens 28. Wie gemiddeld een dag per week geen vlees eet redt dus in totaal ongeveer 103 dierenlevens.

C. Health
Aanbevelingen
We krijgen tegenwoordig veel meer dierlijke producten binnen dan wordt aanbevolen. Dit kan juist schadelijk zijn voor de gezondheid, o.a. omdat deze voedingsmiddelen bijvoorbeeld relatief veel verzadigd vet bevatten 29. Zowel de Gezondheidsraad 30 als het Rijksinstituut voor Volksgezondheid en Milieu (RIVM) 31 raden dan ook aan om minder dierlijke en meer plantaardige voeding te nuttigen.

Ziekten
Onder vegetariërs komen relatief minder mensen te overlijden als gevolg van kanker en zogeheten ischemische hartaanvallen (aandoeningen waarbij het hart onvoldoende wordt doorbloed) dan onder niet-vegetariërs 32 33. Een vermindering van

---

het aandeel dierlijke eiwitten in iemands dieet leidt ook al tot een kleinere kans op hart- en vaatziekten 34, diabetes type 2 35 en obesitas 36.

Voedingswaarde

- Vrijwel alle essentiële voedingsstoffen uit dierlijke producten kunnen uit plantaardige bronnen gehaald worden 37. Vitamine B12 kan aangevuld worden met supplementen. Er is weinig tot geen wetenschappelijke ondersteuning voor eventuele negatieve gezondheidseffecten van soja (volgens de Europese Autoriteit voor de Voedselveiligheid (EFSA)) 38.

---
