

SUSTAINABLE BEHAVIOUR CHANGE INTERVENTION: REDUCING MEAT CONSUMPTION

Sustainable behaviour change intervention: reducing meat consumption

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Acknowledgements

With tensed shoulders but a calm breath, I finally write the last words of this piece. Dreaming of becoming a scientist, I have always imagined that writing my master thesis would be the icing on the cake of my studies Consumer Psychology. That turned out differently. Besides improving my skills on research and academic writing, I have learned more about myself than I could have imagined beforehand. I am proud of my final product and look forward to future challenges.

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Enjoy reading!

Sofia Wolfswinkel

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Abstract

This study attempted to contribute to the ongoing debate between two perspectives of the antecedents of behaviour. One perspective focuses on intention as only proximal determinant of behaviour (e.g. Theory of Planned Behaviour, Ajzen, 1991). The second perspective focusses on the unconscious processes underlying behaviour (e.g. Aarts & Dijksterhuis, 2000). The present study places itself closer to the latter, proposing that habit strength, intention and anticipated emotion are linear determinants of behaviour. Additionally, the study proposed that behaviour can be changed by addressing these determinants repeatedly in an intervention. It was the aim of this study to determine the antecedents of behaviour with the use of sound theory, to develop an empirically robust intervention that reduces meat consumption. The main research question was: "What are the determinants behind behaviour and how can these be addressed to change behaviour". Based on literature, this study has seven hypotheses. 200 participants participated in an online experiment, that was an intervention to reduce meat consumption. The experiment was build up in two parts. One part tested the hypotheses that communicating a promised consequence (positive or negative) influences anticipated emotion (H3) and that communicating a goal (neutral or sustainable) positively influences intention (H6). It was hypothesized that habit strength would negatively affect alternative behaviour, that is a lunch with meat(H1), while anticipated emotion (H4), and intention (H7), would positively influence alternative behaviour, that is a vegetarian lunch. The second part of the experiment tested the hypotheses that providing a negative consequence would negatively influence the habit of default behaviour (H2), and providing a positive consequence would positive influence the anticipated emotion of alternative behaviour(H5). Partial support was found for the first hypothesis. Besides, this study found that when a neutral goal was communicated, habit strength of meat consumption decreased and more vegetarian lunches were picked. The results of the study indicate that with repetition of the manipulation messages, cognitive processes become less prominent and thus, automatic processes become more apparent.

Keywords: Behavioural change, intervention, habit, intention, anticipated emotion, meat consumption

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Introduction

How humans behave has a tremendous impact on ourselves, our social network and the planet we live on. What we eat and how often we exercise can increase our lifespan and overall quality of life, but can also shorten our life and decrease its' quality. Using a smartphone can enhance the contact we have with our indirect social environment while it could also worsen the contact with our close social environment. Human behaviour could mitigate global warming, but could also harm the environment.

“Good” behaviour is beneficial for oneself and their environment, but good behaviour is not necessarily default behaviour. Even if one intends to eat healthier or purchase less animal-based proteins, the eventually performed behaviour can still be opposed to the initial plan. An intention or plan sometimes influences behaviour, but often unconscious processes take over, making behaviour change difficult (E.g. De Bruijn et al., 2008). Interventions aiming at behaviour change can offer a solution for stable behaviour change towards beneficial behaviour for people and their environment.

Many theories have been developed on behaviour and behavioural change. The behavioural antecedents that are described or targeted differ per theory. Theory of Planned Behaviour (Ajzen, 1991), is known for its' focus on intention as only proximal predictor of behaviour. Other theories put the focus on more automatic processes. By attaching rewards or punishments to behaviour (E.g. Operant conditioning, Skinner, 1938), behaviour can be changed through the anticipation of emotions that is evoked by rewards or punishments (Baumeister, 2007). On a subconscious level, nudging interventions aim at changing behaviour by changing an environment to encourage non-default behaviour unconsciously (Thaler & Sunstein, 2008; Bucher et al., 2016).

Despite the difference in focus among different theories on behaviour, all aim for the same when it comes down to behavioural change: behaviour change that remains stable over time. In order to create a behaviour change intervention that is successful and replicable, behaviour change techniques call for two prerequisites: sound theory supported by empirical evidence (Michie & Abraham, 2004) and robust research methods that aim for finding causal relationships (Frederiks et al., 2016).

Michie and Abraham noticed a missing link between sound theory and behaviour change techniques in behaviour change interventions (2004). More specifically, theories describe behaviour rather than prescribe how to change that behaviour (Michie & Abraham, 2004). Michie and colleagues (2011) created an extensive list of behaviour change techniques linked to the theories that they are based on, to fill the gap between theory and intervention techniques. This taxonomy and

recommendations on successful creation of interventions have been widely used in the health domain. Nevertheless, to my knowledge, they have yet to be adopted in other domains.

Changing behaviour in the domain of health is crucial and of great importance, as health problems are, besides environment-related issues, one of the biggest global problems (Griffioen et al., 2016). Changing behaviour in the domain of health, however, is not necessarily applicable to other domains. Health-related behaviours can have direct consequences for an individual. The temporal distance of these consequences can be large, and one might perceive the risk of encountering negative health consequences as low (Griffioen et al., 2016). Nevertheless, the consequences are personal and tangible, especially when compared to environmental-related behaviours (Lucke & Koenigstorfer, 2018).

In the field of sustainability, both theory describing underlying determinants of behaviour (Abrahamse et al., 2005) and robust testing for causal relationships are lacking in behaviour change interventions (Frederiks et al., 2016). In their review, Frederiks and colleagues (2016) describe the lack of robustness of behaviour change techniques and therefore, a lack of causal relation between interventions and observed behaviour. Consequently, even if an intervention turns out to be successful, it is hard to trace the determinants causing that behaviour change (Frederiks et al., 2016). The lack of theory and empirical evidence leads to a lack of replicability and reinvention of the wheel within the field of sustainable behaviour.

Environmental problems being one of the biggest global challenges and top priorities for the United Nations (See Sustainable Development Goals, 2015), changing consumer behaviour towards more sustainable behaviour is crucial and increasingly urgent. As stressed in the report Climate Change and Land (IPCC, 2019), an adjustment of everyday consumption can mitigate climate change. More specifically, the report recommends a more plant-based diet to reduce carbon emission from the livestock industry (IPCC 2019). Put simply; consumers should eat less meat. Besides, growing evidence is showing the negative consequences of (red) meat consumption on consumers' health (Rizzo et al., 2013; Joyce et al., 2012).

Designing an intervention to reduce meat consumption is thus beneficial in practical terms of mitigating climate change and enhancing personal health. Developing a robust, and evidence-based, intervention aiming at reducing meat consumption will also contribute to the existing gap in the literature. This study, therefore, has three aims: to develop an intervention that (1) is based on sound theory, (2) is empirically robust, mapping causal determinants behind behaviour, (3) reduces meat consumption. The main research question leading this study will be: "What are the determinants behind behaviour, and how can these be addressed to change behaviour?"

Theoretical framework

Antecedents of behaviour

Behaviour can be changed for different purposes. Behaviour change has been widely used in marketing, aimed at increasing sales and revenues. Yet, over the last decades, the purpose of behaviour change has been extended to change behaviour into normatively good or better behaviour. Changing behaviour for moral reasons can be beneficial for a person (e.g. an increased wellbeing because of more mindfulness), for a person's social environment (e.g. increased productivity at work when someone has quit smoking), and on a global scale (e.g. a lower carbon footprint due to a reduction in meat consumption). Changing behaviour towards good or better behaviour can have a wide range of benefits.

For an intervention to be effective, a clear theoretical understanding of behaviour and its antecedents is necessary (Abraham & Michie, 2008; Michie & Abraham, 2004). Both Michie and colleagues (2008) as well as Fishbein and colleagues (2001) created a list of behavioural determinants for behaviour change, varying from personal traits, such as skills and knowledge, to environmental circumstances (See Michie et al., 2008). For any behaviour to come about, skills to perform that behaviour, an environment allowing for that behaviour and an intention to perform that behaviour are "necessary and sufficient" (Fishbein et al., 2001). Yet, some determinants are more relevant than others, when changing behaviour into good or better behaviour.

Four antecedents of behaviour are especially relevant for behavioural change. The first one being environmental factors, which exists of the situational factors, and the products and services to be purchased (Solomon, 2012). Simply put, it is everything happening outside of a person's characteristics (Solomon, 2012). Another antecedent of behaviour is habit (Verplanken & Aarts, 1999; De Bruijn 2008; Rees et al., 2018). Generally, people behave how they are used to behave in a situation, without giving it much thought. Next is the anticipation of emotion as an antecedent of behaviour. Typically, people behave according to what emotion they expect to experience (Perugini & Bagozzi, 2001; Parker et al., 1995; Richard et al., 1995). Lastly, intention is an antecedent of behaviour which describes the active planning to perform a certain behaviour (e.g. "I will eat less meat this week") (Fishbein et al., 2001).

Changing behaviour through environmental factors. Changing behaviour through interventions in the purchase environment is typically called nudging (Bucher et al., 2016). Nudging refers to changes made in the environment to change behaviour into better or good behaviour, without taking away the possibility to behave differently (Bucher et al., 2016). Typical examples

include making stairs more prominent in a building to encourage physical activity or putting fruit instead of candy at the counter to promote healthy eating.

Successful results have been found in the field of nudging, yet when aiming for stable behaviour change, nudging might not be the best possible intervention technique. The first reason for this, is that nudging is bound to its' specific place, context and environment. Consequently, behaviour changed through nudges does not necessarily "spill over" to other behaviour or other contexts. To illustrate, going to a third floor by stairs because the stairs are more prominently visible than less active alternatives does not necessarily predict that someone will take the stairs in a building where elevators are more prominent. On the other hand, as with any often-repeated behaviour, if a person is nudged repeatedly to take the stairs, it could become a habit (E.g. Oullette & Wood, 1998), and spill-over to other places and environments. Nevertheless, other processes underlying behaviour should be addressed as well.

By changing the environment, nudging aims at unconsciously changing behaviour, and therewith, circumventing other processes that influence behaviour. Because of this, theory behind nudging implicitly holds the assumption that other processes remain stable. For example, when a certain nudge aims at making people eat more apples instead of chocolate bars, it simultaneously assumes that a person is, at least latently, motivated to eat that apple. When a person, however, is not too keen on apples, or was deliberately looking for a sugary snack, a change in the environment will not do the trick (Van Kleef & Van Trijp, 2018).

Aiming at automatic processes as nudging does, can have successful results in behaviour change. Yet, the importance of other behavioural processes cannot be left out. Other predictors of behaviour have to be taken into account when developing behaviour change interventions.

Psychological antecedents of behaviour. Whereas environmental factors take place outside a person, habit, anticipated emotions and intention are psychological processes taking place within a person. Psychological processes range from conscious and deliberate processes to unaware and automatic processes (E.g. Evans, 2008). Despite the popular distinction between cognitive and automatic processes in dual-process literature, automatic processes can vary in intensity of automatism (Evans, 2008; Glöckner & Witteman, 2010). For example, whereas habits function automatically without necessarily influencing intentions (E.g. Aarts & Dijksterhuis, 2000; Oullette & Wood, 1998), emotions can function as automatically but still influence intentions and therefore become more conscious and deliberate (E.g. Perugini & Bagozzi, 2001).

Habits. Among the most automatic and unaware antecedent of behaviour to consider when changing behaviour, are habits. Positive emotions that follow after the execution of a behaviour lead to the repetition of that behaviour (Neal et al., 2006; Van't Riet et al., 2011; Wood & Neal, 2007). The repetition of the same behaviour triggered by the same situational cues, form new habits (Rees et al., 2018, De Bruijn et al., 2008; Oullette & Wood, 1998). Habits are performed without intention or awareness, are hard to control, and are therefore hard to change (Rees et al., 2018; Aarts & Dijksterhuis, 2000).

Behind unwanted behaviour lie unwanted habits. To change that unwanted behaviour, the habit behind that behaviour should break or at least become less prominent. Simultaneously, new habits should become more prominent. It is thus the "default behaviour", that is the habit, that should change towards "the alternative behaviour", that is the preferred outcome of behaviour change intervention. In line with previously mentioned findings, it is therefore hypothesized that:

H1) "The stronger the habit of a default behaviour, the less likely the performance of alternative behaviour."

Due to the strong and automatic nature of habits, they are hard to change. One way to break habits, suggested by Verplanken & Wood (2006), is to pair negative consequences to the unwanted behaviour. With this, negative consequences serve as a form of punishments for performing the unwanted behaviour (van't Riet et al., 2011). This is in line with the theory behind operant conditioning, as proposed by Skinner in 1938. Operant conditioning entails "behaviour controlled by its consequences", that is either the reinforcement of wanted behaviour or the punishment of unwanted behaviour (Skinner, 1938; 1948). Reinforcement is split into two sorts: positive reinforcement, that is getting a reward for performing wanted behaviour, and negative reinforcement, being the absence of a punishment (Skinner, 1938; 1948). Punishment is the negative consequence of the unwanted behaviour (Skinner, 1938; 1948). Furthermore, negative consequences after a behaviour induce negative emotions regarding that behaviour, unconsciously signalling that the behaviour might need to change (Baumeister et al., 2007). This negative emotion will be remembered, the next time the behaviour is about to be performed (Baumeister et al., 2007). When the negative emotion is paired multiple times to the initial behaviour, a new behaviour has space to become more preferable and might eventually change to new initial behaviour (Baumeister et al., 2007). In line with the theory of operant conditioning, and the suggestions of Verplanken & Wood (2006) and Baumeister and colleagues (2007), it is hypothesized that:

H2) "Providing a negative consequence after the performance of the default behaviour negatively influences the habit strength of that behaviour".

Anticipated emotions. Emotions play a crucial role in the formation of new habits, as the positive emotion followed after the performance of a behaviour stimulates the repetition of that behaviour (Neal et al., 2006; Van't Riet et al., 2011; Wood & Neal, 2007). This happens on both unconscious and automatic levels, as well as more conscious and cognitively deliberate levels (Lerner et al., 2015).

Automatic positive emotions are found to enhance the pursuing of goals (Baumeister et al., 2007; Custers & Aarts, 2005), and thus the performance of alternative behaviour. Custers and Aarts (2005) found that priming people with an emotionally positive term attached to a behavioural state, increased a positive association with that behavioural state. In other words, priming a person with a positive emotion attached to a behaviour increases the anticipated positive emotion of that behaviour (Baumeister, 2007; Custers & Aarts 2005). Thus, in the case of behaviour change and forming new habits, cueing a positive emotion attached to the alternative behaviour, should increase the anticipated positive emotion of executing that alternative behaviour. Therefore, it is hypothesized that:

H3) "Promising a positive consequence after the execution of the alternative behaviour, positively influences positive anticipated emotions regarding that alternative behaviour".

It is not necessarily the actual emotion that guides behaviour, but rather the anticipation of an emotion that influences behaviour (Baumeister et al., 2007). The emotion a person expects to experience by the execution of a behaviour that influences that behaviour (Baumeister, 2007; Evans, 2008). The anticipation of a positive emotion for performing alternative behaviour could thus stimulate the actual performance of that alternative behaviour. In line with this, it is hypothesized that:

H4) "The anticipation of a positive outcome after the execution of the alternative behaviour increases the likelihood of the performance of that behaviour".

The emotion that is attached or experienced after the performance of a behaviour will leave, what Damasio (1994) called, a "somatic marker". That is, one will, unconsciously, remember the emotion that belongs to the last time the about to be performed behaviour, was performed (Baumeister et al., 2007; Damasio, 1994). Thus, when alternative behaviour is executed and followed by a consequence that induces positive emotion, next time that alternative behaviour is about to be performed the positive emotion will be unconsciously remembered. This (unconsciously remembered) anticipated positive emotion will then again stimulate the performance of the alternative behaviour. As with negative consequences, attaching positive consequences to a behaviour repeatedly makes the performance of that behaviour more preferable, and might therewith become a new default

behaviour (Baumeister et al., 2007). Building on this, it is hypothesized that:

H5) "Providing a positive consequence after the execution of alternative behaviour positively influences anticipated emotion regarding that behaviour".

Intention. Intention, that is actively planning to behave a certain way, is considered a more deliberate antecedent of behaviour compared to habit strength and anticipated emotions (Rees et al., 2018). A frequently used theory used in behaviour change studies, is Theory of Planned Behaviour (TPB; Ajzen, 1991). Theory of Planned Behaviour describes intention as the proximal predictor of behaviour. Intention is influenced by self-efficacy, social norms and attitudes (Ajzen, 1991). The attitude someone has towards a behaviour describes one's overall feeling towards that behaviour, social norms entail how one's social environment would whether or not approve of that behaviour, and self-efficacy describes to what extent people perceive themselves as capable of performing that behaviour (Ajzen, 1991; Fishbein et al., 2001). Each of these antecedents of intention are influenced by the combination of the belief about a behaviour and the evaluation of that behaviour (Fishbein & Ajzen, 1975). Beliefs about a behaviour can be described as what one would consider to be true about that behaviour (E.g. "Eating falafel is sustainable behaviour"), evaluations describe to what extent one experiences attributes of that behaviour as positive or negative (E.g. "I like to eat falafel" and "sustainable behaviour is good") (Fishbein & Ajzen, 1975). The combination of one's beliefs and evaluations are comparable to goals. It is therefore hypothesized that:

H6) "Setting a goal to perform the alternative behaviour positively influences the intention to perform that behaviour."

The Theory of Planned Behaviour (Ajzen, 1991) describes intention as a proximal predictor of the performance of a behaviour. Intention as proximal predictor of behaviour has become a popular theory and is convenient when attempting to predict behaviour. Nevertheless, intention as proximal predictor of behaviour only accounts for an average of a third in behaviour (Armitage & Conner, 2001; McEachan et al., 2011). The lack of variance in behaviour that is explained by intention is known as the intention-behaviour gap (Orbell, Hodgkins, & Sheeran, 1997; Sheeran, Orbell, & Trafimow, 1999).

Effort to bridge the intention-behaviour gap include adding moderators, such as habit (Rees et al., 2018), or making intentions more conscious and explicit, for example through if-then plans (Gollwitzer, 1999). These efforts aim at increasing the explained variance of intention in behaviour instead of determining other possible antecedents of behaviour. Adding multiple predictors to behaviour rather than attempting to close the intention-behaviour gap, could provide a more accurate prediction of behaviour. The current study aims at the latter and takes intention as one of three predictors, instead of proximal predictor of behaviour, as starting point. Therefore, along with habit

and anticipated emotion, it is hypothesized that:

H7) “The stronger the intention of a behaviour, the more likely the performance of that behaviour”

All hypotheses are summarized in the theoretical model in Figure 1.

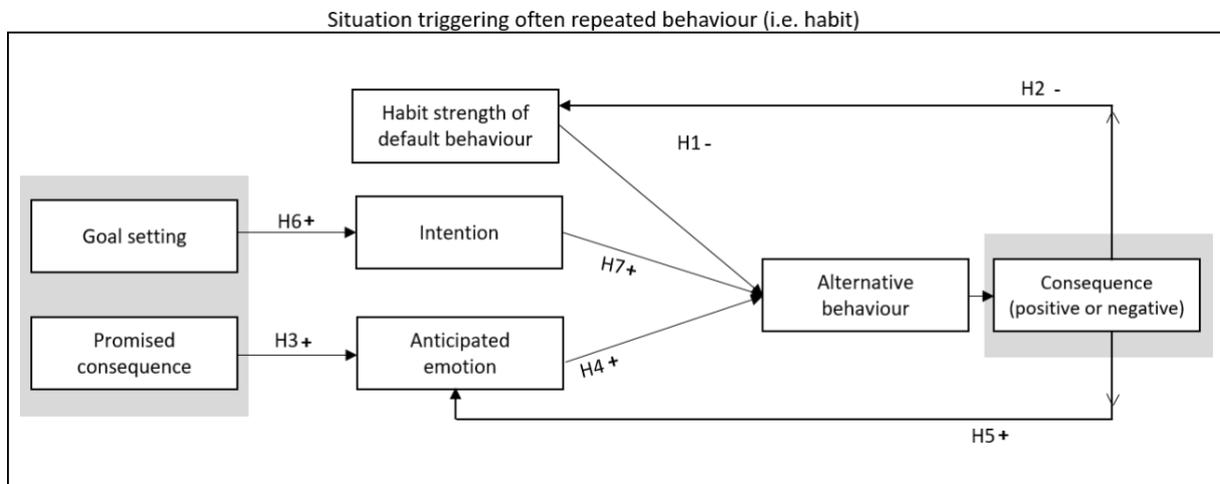


Figure 1. Theoretical model of antecedents of behaviour and behaviour change interventions.

Field of application: meat consumption

One behaviour that has both consequences on a personal as well as on a global scale, is meat consumption. One of the largest drivers of climate change and global warming, is the meat industry and therewith meat consumption (Bailey et al., 2014). The total emission on a global scale of the livestock industry is more than all global transport (E.g. cars, ships, airplanes) together (Bailey et al., 2014). The consequences of meat consumption on the environment has become increasingly important over the past decade, and its’ seriousness has been even more confirmed by the latest report of the IPCC (2019). Reducing meat consumption can mitigate climate change and is therefore a consumption behaviour that has a large urgency to be changed (IPCC, 2019).

In addition, meat consumption reduction can be beneficial for personal health (Rizzo et al., 2013; Joyce et al., 2012). There is growing evidence on the positive correlation between meat consumption and colorectal cancer (Larsson & Wolk, 2006), type 2 diabetes (Aune et al., 2006), coronary heart disease, and cancer (Rizzo et al., 2013; Joyce et al., 2012). Thus, shifting towards a more plant-based diet that contains less meat is both beneficial for personal as well global reasons.

Furthermore, putting meat consumption along the lines of the psychological antecedents of behaviour, meat consumption is a highly habitual behaviour (e.g. Rees et al., 2018). Meat

consumption triggers positive emotions as meat is a popular source of protein, that consumers perceive as nice and tasty (Stoll-Kleemann & Schmidt, 2015; Piazza et al., 2015). In addition, Rees and colleagues, showed in 2018 that people that consume meat on a frequent basis ate less meat after an intervention applying implementation intentions. This shows that intentions play an important role in meat consumption, even for frequent meat eaters. In conclusion, all psychological antecedents play a role in meat consumption and can be addresses to change meat consumption behaviour.

Methods

Participants and design

214 students from Wageningen University were recruited to participate in a 2 (vegetarian lunch behavioural incentive versus neutral behavioural incentive) x 2 (promised positive consequences versus no promised consequence) design computer experiment. Participants were invited through promotion on campus and social media. To promote participation for the study, students were rewarded with a chocolate bar. No outliers were excluded, only 14 vegetarian or vegan participants were excluded from the study, as they already exclude meat from their diet. The average age of the participants was nearly 22 (21.9) years old. Of all participants, 63.5% identified as female, 35% as male, and 1.5% as non-binary, none reported "other". The study was preregistered at OSF (https://osf.io/b4dtk/?view_only=88cb8902cb3c4bd5a8af00762f1f7b6c) and approved by the Social Sciences Ethics Committee of Wageningen University.

Materials

The experiment existed out of a general introduction, an explanation of the Tree Growing Game, two stimuli, and two possible consequences. In the introduction to the study, the participant was informed about the duration of the study, that the conducted data remains anonymous and that the participant is free to quit the experiment at any time.

Rewards and punishments: The Tree Growing Game. In order to allow for accumulated rewards, the intervention made use of a set-up in which participants collected trees to plant in their personal virtual garden. The tree was either alive or dead, dependent on the participants' behaviour. This set-up is comparable to the set-up of some gamification studies. Gamification uses the combination game characteristics and psychological theory in order to change behaviour (Lidia et al., 2018). This experiment was inspired by a mobile phone application, Forest App, that enhances focus by blocking the use of other applications while planting plants (Seekrtech, 2020). This game-like set up allows for the experiment to be more enjoyable and manipulate participants less obviously. The following explanation was provided to the participants about the game: "Welcome to the Tree

Growing Game! For this game, you will get your personal garden in which you can grow trees! There will be five rounds, each round you will get a new tree.” Participants got to see a picture of their empty virtual garden and of a virtual tree (figure 2a and 2b), and were provided with the text: “Here is your tree, take good care of it!”

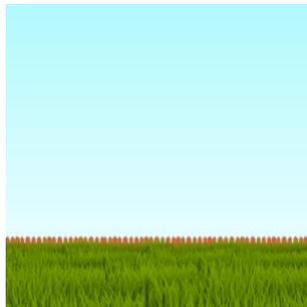


Figure 2a Empty virtual garden at the starting of the game **Figure 2b** New living tree provided at each new round

Stimuli. To test hypothesis 3 “Promising a positive consequence after the execution of the alternative behaviour, positively influences positive anticipated emotions regarding that alternative behaviour” and hypothesis 6 “Setting a goal to perform the alternative behaviour positively influences the intention to perform that behaviour” a combination of two stimuli were used, depending on the condition (See table 1).

Table 1 Stimuli text in four different conditions, bold and italic letters were not shown to participants.

		Communicated Goal	
		Sustainable behaviour goal	Neutral goal
Communicated Consequence	Positive	Behave sustainably, pick a vegetarian dish. If you behave sustainably, your tree will be added to your garden alive.	Time to eat, pick a dish. If you behave sustainably, your tree will be added to your garden alive.
	Negative	Behave sustainably, pick a vegetarian dish. If you do not behave sustainably, your tree will be added to your garden dead.	Time to eat, pick a dish. If you do not behave sustainably, your tree will be added to your garden dead.

Consequences. A consequence was provided depending on the participant’s behaviour to test hypothesis 2 and 5, respectively “Providing a negative consequence after the performance of the default behaviour negatively influences the habit strength of that behaviour.” and “Providing a

positive consequence after the execution of alternative behaviour positively influences anticipated emotion regarding that behaviour". When the participants chose to pick a vegetarian option, a living tree would be added to their virtual garden, when they picked a non-vegetarian option a dead tree was added to their virtual garden. The trees stayed in the garden and accumulated each round, regardless of following behaviours. Consequently, at the end of the game participants would have five trees in their garden, five living trees, five dead trees or a combination (For examples see figure 3a, 3b and 3c).

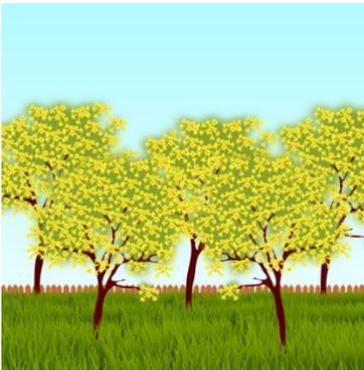


Figure 3a Result of picking five vegetarian lunches in total: five living trees at the end of the game



Figure 3b Results of picking five lunches with meat in total: five dead trees at the end of the game



Figure 3c Result of picking two vegetarian and three meat lunches in total: two living and three dead trees at the end of the game

Measures

Behaviour. The behaviour of the participant was measured by the option they picked for lunch, which was either vegetarian or not vegetarian. The vegetarian option was perceived as alternative behaviour. Participants were provided with four options, two vegetarian and two non-vegetarian options. Each round, the options would vary, the division (two vegetarian and two non-vegetarian) remained the same (Figure 4a till 4e). The options were randomized per round.

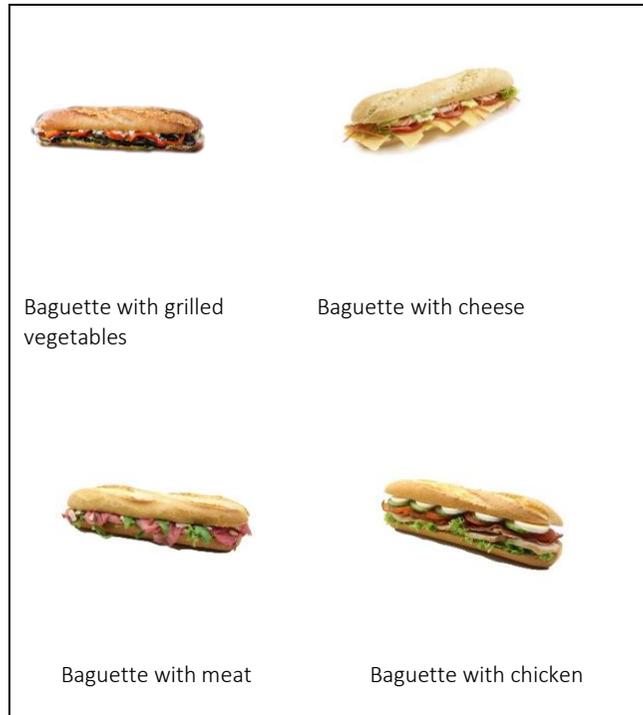


Figure 4a Grilled sandwiches



Figure 4b Baguettes

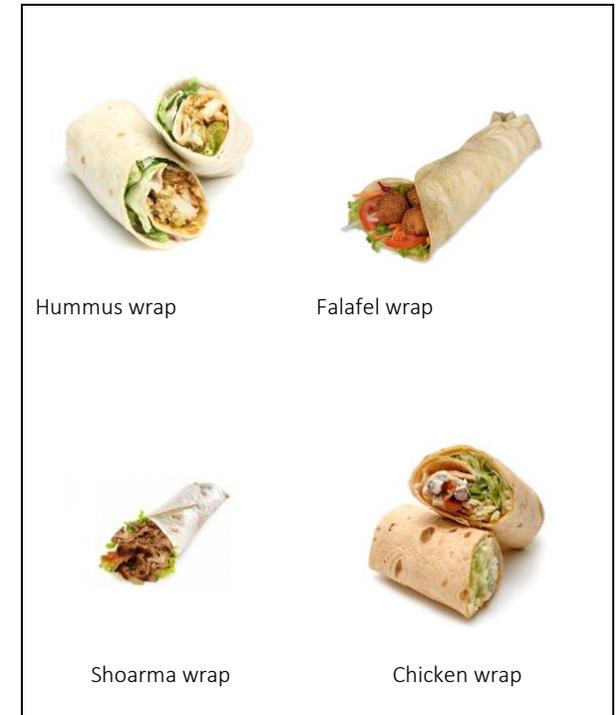


Figure 4c Soups

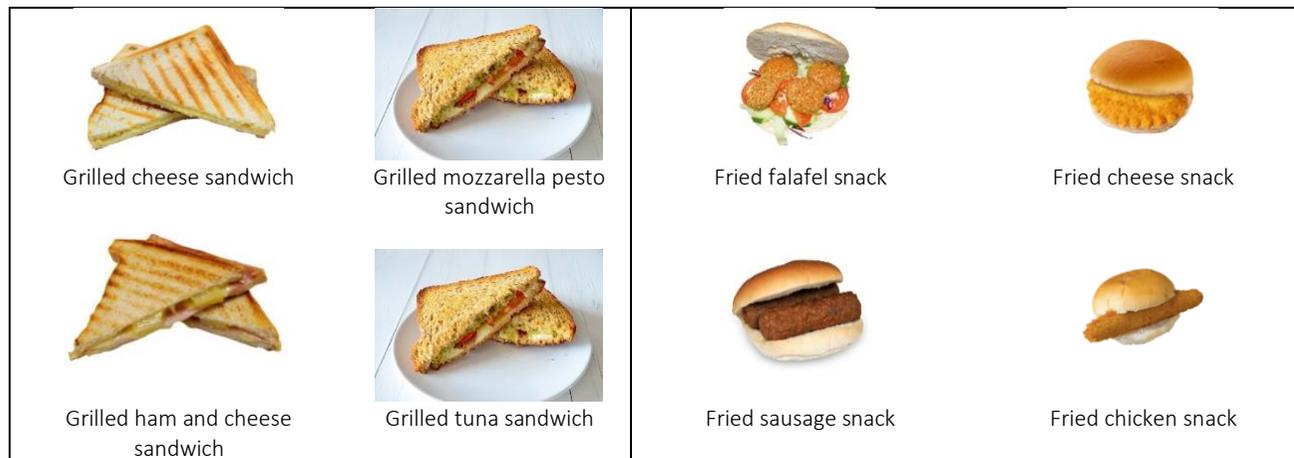


Figure 4d Fried snacks on buns

Figure 4e Wraps

Intention. Hypothesis 7: “The stronger the intention of a behaviour, the more likely the performance of that behaviour”, the intention to behave sustainably was measured with 2 items, based on Brug and colleagues (2006): (1) “I intend to pick a vegetarian lunch”, (2) “I am certain that I will pick a vegetarian lunch.” The two items were rated on a visual analogue scale that ranged from totally disagree to totally agree. The items were recorded from 0 to 100, the participant could not see these numbers.

Anticipated emotion. The anticipated emotion of behaving sustainably and of not behaving sustainably were measured on one item each: (1) “How do you feel about picking a vegetarian lunch?”, and (2) “How do you feel about not picking a vegetarian lunch?”. Both were measured on a visual analogue scale with smileys (Figure 5). The combination of a visual analogue scale and smileys are often used in pain assessment as pain, like other feelings, are subjective (Belville et al., 2005). Smileys can assist in making feelings and emotions more concrete.

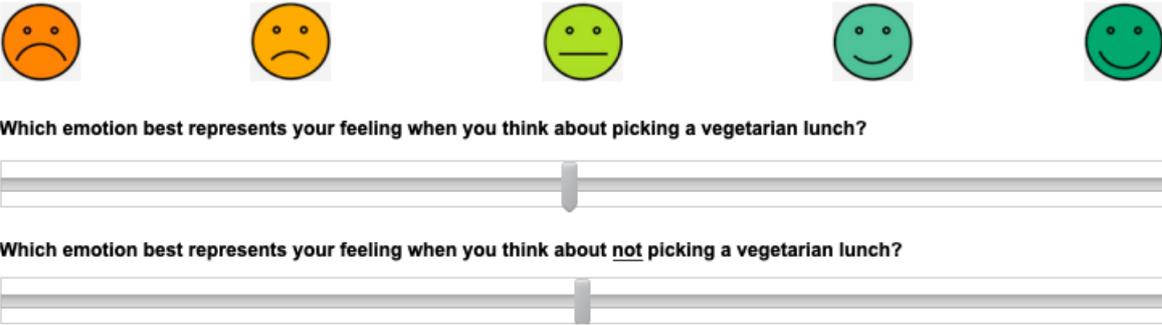


Figure 5 Visual analogue scale with smileys to measure anticipated emotions

Habit. The construct of habit strength of meat consumption was measured with the use of the Self-Report Habit Index (SRHI) as created by Verplanken & Orbell (2003). Five of the twelve items were used, as they have been suggested to be a more parsimonious measure of habit strength (Gardner et al., 2012; Rees et al., 2018). The same items for meat consumption habit strength was used as Rees and colleagues used in 2018: Eating meat is something (1) I do automatically, (2) I do without having to consciously remember, (3) I do without thinking, (4) I have no need to think about doing, (5) that is typically me. These five items were rated on a visual analogue scale ranging from totally disagree to totally agree. The items were recorded from 0 to 100, the participant could not see these numbers.

Manipulation check and background information. The manipulation was checked by two questions about the game: (1) “To what extent were you in control of what happened to the trees in your garden?” and (2) “To what extent did you like the game?”. In addition, two questions were asked regarding the trees: (1) “To what extent do you like trees?” and (2) “To what extent do you like

nature?”. All questions were rated on a visual analogue scale ranging from not at all to very much. The items were recorded from 0 to 100, the participant could not see these numbers.

To gain more insight in the participants background regarding awareness and care about health, the environment and animals, participants were asked to rate eight statements on a visual analogue scale ranging from not true at all to very true: (1) “I consider myself as sustainable person”, (2) “Climate change is caused by humans”, (3) “I care about my carbon footprint”, (4) “I care about my personal health” (5) “I think it is important to eat healthy”, (6) “I care about animal welfare”, (7) “The bioindustry is bad”, (8) “I like animals”. The items were recorded from 0 to 100, the participant could not see these numbers. All questions were randomized per participant. The participants were also asked what they normally eat for lunch. They could choose between: (1) Plant based, (2) Vegetarian, (3) Meat or fish, (4) Meat, no fish, (5) Fish, no meat, (6) Meat or fish, organic, (7) Only meat, organic, (8) Only fish, organic.

Participants’ demographics, age, gender, and study background were asked.

Procedure

The experiment started with an introduction and a question whether the participant was vegetarian/vegan or not. Vegetarians and vegans were thanked and excluded. Next, habit strength of meat consumption was measured for the first time, to function as a baseline. After this, the explanation of the Tree Growing Game, and the first virtual tree was provided to the participant. Then, the goal setting and promised consequence were provided (Table 1). On the next page the participant would answer the anticipated emotion and intention questions. After answering these questions, participants were directed to the choice page where they could pick a vegetarian lunch (two options) or a non-vegetarian lunch (two options, either meat or fish). Right after the lunch was picked, the participant would see their virtual garden with either a living tree or a dead tree in it. Then the participant was forwarded to the screen with a new living tree, followed by the same goal setting and promised consequence as was provided in the previous round. Hereafter, the participant had to answer the anticipated emotion and intention questions and was then forwarded to pick a new lunch (vegetarian/non-vegetarian). Depending on the picked lunch, a new tree, either dead or alive, was added to the participant’s virtual garden. This sequence was repeated three more times.

After the Tree Growing Game was played five times, habit strength of meat consumption was measured again. Then, questions regarding the game were asked, followed by the questions regarding health, the environment, bio industries and animals. Lastly, questions regarding the

participant's demographics were asked. After completing the experiment, the participant was thanked and was able to fill in their mail address to win a gift card.

Data analysis

Variables and scales. As some variables were measured with multiple items, reliability was checked for variables with more than two items. Items belonging to the same variable were put on the same scale.

Anticipated emotion. Anticipated emotion of picking a vegetarian lunch was measured with two items: anticipated emotion regarding picking a vegetarian lunch and anticipated emotion regarding not picking a vegetarian. This was measured for each of the five rounds. Before combining the items on one scale, a correction had to be made regarding the items of anticipated emotions in the fifth round of the third condition (Neutral Goal setting and Positive Communicated Consequence). By accident, these items were measured on a -5 to 5 scale instead of a 0 to 100 scale. These items were rescaled ($((\text{Anticipated Emotion Original} + 5) / 10) * 100$). Consequences to the variance of the scale were taken into account. The following scales were created. Anticipated emotion of picking a vegetarian lunch and not picking a vegetarian lunch were combined per round in variable (1) Anticipated Emotion round 1, 2, ... 5. The average of Anticipated Emotion of all rounds together were scaled as (2) Mean Anticipated Emotion. Anticipated emotion of picking a vegetarian lunch per round were scaled as (3) Anticipated Emotion Positive round 1, 2, ..., 5. Anticipated emotion of not picking a vegetarian lunch were scaled as (4) Anticipated Emotion Negative round 1, 2, ... 5.

Intention. Intention of picking a vegetarian lunch was measured with two items, and were put on the same scale for each round (1) Intention round 1, 2, ... 5, and an average of all rounds were put on a scale as (2) Mean Intention.

Habit strength of meat consumption. Habit strength of meat consumption was measured two times, before the Tree Growing game, T=0 and after the Tree Growing Game, T=6. As habit strength of meat consumption was measured with five items, a reliability check was done before the items were put on the same scale. Scales for both variables were reliable with all items included, Habit Strength of Meat Consumption T=0, Cronbach's $\alpha = .877$, Habit Strength of Meat Consumption T=6, Cronbach's $\alpha = .887$.

Manipulation message. Depending on the condition, each participant got a message each round of the game including a communicated goal setting (neutral/sustainable) and communicated consequence (positive/negative). These variables will be referred to as Communicated Goal and

Communicated Consequence. The conditions will be referred to as Communicated Neutral/Sustainable Goal + Positive/Negative Consequence.

Background variables. Background questions regarding the extent to which the participant cared about the environment, health and animals were asked. Three questions about the environment were combined on the same scale, Climate Care, Cronbach's $A=.706$. Two questions about health were combined on the same scale, Health Care, Cronbach's $A=.785$. Two questions of the three about caring about animals were scaled together, Animal Care, Cronbach's $A=.749$. The statement that the bio industry is bad, did not fit on the Animal Care scale, Cronbach's $A=.369$ when included.

Picked lunch. Each round the participant had to pick a lunch, either vegetarian or meat. For each vegetarian lunch picked, the participant would get a living tree, for each meat lunch picked, the participant would get a dead tree. The trees the participant got each round and in total, functioned as either a positive or negative consequence. The variables referred to hereafter, will therefore be either Accumulated Picked Lunches and Accumulated Living Trees, both ranging from 0 to 5, as each meat lunch counted as a 0 and each vegetarian lunch as 1. When testing for effects per round, the picked lunch will act as a dichotomous variable and will be referred to as Lunch Picked round 1, 2, ... 5.

Statistical tests. Assumptions belonging to each test will be checked. In case of violation of an assumption, adequate alternatives will be considered. The effect of the intervention will be tested, that is to what extent the intervention messages (Communicated Goal and Communicated Consequence) affected the lunch picked (meat or vegetarian). This will be measured in two ways. A two-way ANOVA will be run with Accumulated Lunches Picked as continuous dependent variable. A binominal logistic regression will be run with Lunch Picked round 5, because round 5 is expected to have the strongest effect due to repetition of the intervention.

Hypotheses. The first, fourth and seventh hypotheses will be tested in two ways. Binominal logistic regressions will be run with Lunch Picked round 1, 2, ...5. In this analysis, it will be investigated to what extent Habit of Meat Consumption $T=0$, Intention round 1, 2, ... 5 and Anticipated Emotion of picking a vegetarian lunch round 1, 2, 3, ...5, significantly predicted the lunch picked in that round. A three-way ANOVA will be performed with Habit Strength of Meat Consumption $T=0$, Mean Intention and Mean Anticipated Emotion on Accumulated Living Trees, to investigate whether there was a difference between conditions in the total amount of times a participant had picked a vegetarian lunch and therewith a living tree.

The second hypothesis will be tested with two linear regressions, to investigate the predictability of the provided consequence, living or dead tree(s), on the second time habit strength of

meat consumption was measured (T=6). One linear regression will be performed with Consequence Provided (either a living tree or a dead tree) on Habit Strength of Meat Consumption T=6. The other linear regression will be tested with Accumulated Living Trees on Habit strength of Meat Consumption T=6.

The third and sixth hypotheses will be tested with five separate ANOVAs. For hypothesis 3 with Communicated Consequence on Anticipated Emotion round 1, 2, ... 5, to see whether the communicated consequence significantly predicts anticipated emotion of picking a vegetarian lunch for each round. For hypothesis 6 with Communicated Goal on Intention round 1, 2, ... 5, to see whether the communicated goal significantly predicts intention to pick a vegetarian lunch for each round.

The fifth hypothesis will be tested with four linear regressions, to investigate whether the provided consequence (either a living or a dead tree) in the previous round, significantly predicts the anticipated emotion of picking a vegetarian lunch in the next round.

Exploratory analyses. Additional analyses will be performed to investigate the data aside from testing the hypotheses. Further investigations might be performed to further investigate findings.

Habit. The difference between habit strength of meat consumption before and after the Tree Growing Game will be measured with a paired sampled t-tested. A two-way ANOVA will be done to investigate whether there is a difference in change of Habit Strength of Meat Consumption between manipulation messages Communicated Goal and Communicated Consequence.

Intention. A repeated-measures ANOVA will be performed to see how intention to pick a vegetarian lunch develops throughout the Tree Growing Game.

Anticipated emotion. A repeated-measures ANOVA will be performed to see how anticipated emotion of picking a vegetarian lunch develops throughout the Tree Growing Game. Another repeated-measures ANOVA will be performed to see how the anticipated emotion of not picking a vegetarian lunch develops throughout the Tree Growing Game.

Lunches. Binominal logistic regressions will be done to investigate whether a picked lunch in one round would predict a lunch picked in the next round.

Results

Descriptive statistics of background variables. Percentages of picked lunches and the ratio of meat versus vegetarian lunches picked per round are displayed in figure 6. Figure 6 shows an overall preference for vegetarian lunches each round. Participants had a mean meat consumption of a 1.4 times a day and 3.7 times a week. Participants reported that they eat meat most frequently during dinner (89.5%), after that during lunch (38.5%), and after that during breakfast (4.5%). Participants did not often report to eat meat as a morning, afternoon or evening snack (respectively 0.5%, 0.5%, 3%).

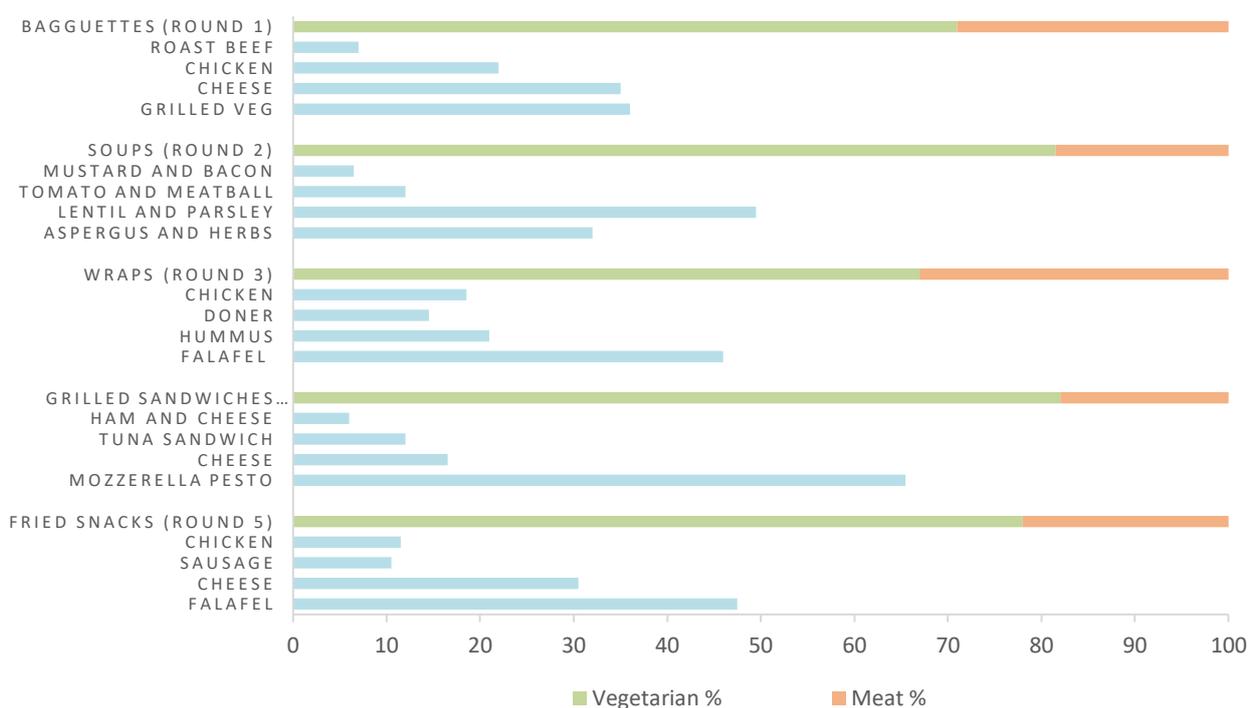


Figure 6 Lunches picked in percentages per round and ratio meat versus vegetarian per round

Means and standard deviations of the background variables per group are displayed in table 2. Overall, participants reported that they felt in control of the game (77.39%, 0 is no control and 100 is a 100% control), indicating that they mostly understood that their own behaviour determined whether they would receive a living or a dead tree. Participants reported a that liked the game to a medium extent (52%). Participants that had received a message that communicated a neutral goal and a positive consequence liked the game the most (57.51%), participants that had received a message that communicated a sustainable goal and a positive consequence reported to like the game the least of all groups (48.58%). Generally, participants reported that they like trees (82.82%) and nature (90.09%) to a large extent. Participants reported to care about health (84.56%) to a larger extent than about climate (71.60%) and animals (78.69%). Participants reported that they think that the bio-industry is bad to a medium extent (50.59%).

Table 2 Means and standard deviations of background variables for four conditions of the experiment

	Sustainable goal setting, positive consequence (N=48)		Neutral goal setting, positive consequence (N=53)		Sustainable goal setting, Negative consequence (N=55)		Neutral goal setting, negative consequence (N=44)		Total (N=200)	
	M	SD	M	SD	M	SD	M	SD	M	SD
In control of game	78.60	24.90	76.36	21.79	79.80	24.22	74.27	25.43	77.39	23.95
Likes game	48.58	23.93	57.51	27.01	50.22	25.48	51.59	28.82	52.06	26.33
Likes trees	82.54	18.35	82.11	14.73	82.65	14.36	84.16	17.91	82.82	16.19
Likes nature	87.67	13.76	90.68	11.16	89.64	12.76	92.59	10.43	90.09	12.16
Cares about climate	72.78	14.52	73.03	14.84	69.78	14.18	70.86	14.77	71.60	14.52
Cares about health	85.40	15.67	83.07	13.54	85.33	10.33	84.48	11.49	84.56	12.82
Cares about animals	79.11	17.59	76.44	16.85	79.04	19.28	80.49	16.72	78.69	17.63
Thinks bio industry is bad	46.40	28.41	47.04	28.33	53.51	27.11	55.77	23.08	50.59	27.03
Weekly meat consumption*	3.83	1.88	3.53	1.69	3.62	1.83	3.70	1.71	3.67	1.77
Meat consumption a day*	1.48	0.85	1.38	0.53	1.22	0.42	1.41	0.58	1.37	0.61

Note. All variables were measured on a 0 to 100 scale, except for variables marked with a *. Variables marked with * were measured on a 0 to 5 scale.

Randomisation checks. Randomisation checks were performed on several variables. ANOVAs were run to investigate the randomisation of the participant's age, habit strength of meat consumption, daily meat consumption and weekly meat consumption per condition. No reason was found to assume a difference in gender across condition, $\chi^2(6)=5.364$, $p=.498$. No reason was found to assume that there was a difference in age between conditions, $F(3, 196)=0.312$, $p=.817$. No reason was found to assume that there was a difference in habit strength of meat consumption between conditions before the Tree Growing Game, $F(3, 196)=1.327$, $p=.267$. No reason was found to assume that there was a difference in daily meat consumption between conditions, $F(3, 196)=1.718$, $p=.165$. No reason was found to assume that there was a difference in weekly meat consumption between conditions, $F(3, 196)=0.267$, $p=.849$.

Effectiveness manipulation messages. The effectiveness of the manipulation messages (sustainable goal setting/neutral goal setting and positive/negative consequence on picked lunch/living trees) on the picked lunch was tested in two ways: (1) with a two-way ANOVA and (2) with a binomial logistic multiple regression.

In the two-way ANOVA, a significant main effect was found for goal setting on the continuous dependent variable Living Trees (i.e. sum of living trees/vegetarian meals at the end of the game, after five rounds, between 0 and 5). $F(1, 196)=4.837$, $p=.029$, partial $\eta^2=.024$ to the effect that not setting a goal resulted in more vegetarian lunches picked. No significant effect was found of Communicated consequence on Living Trees, $F(1, 196)=2.882$, $p=.091$, partial $\eta^2=.014$ and no interaction effect was found between the two independent variables on Living Trees, $F(1, 196)=0.843$, $p=.360$, partial $\eta^2=.004$. The means of the picked lunches are displayed in figures 7.

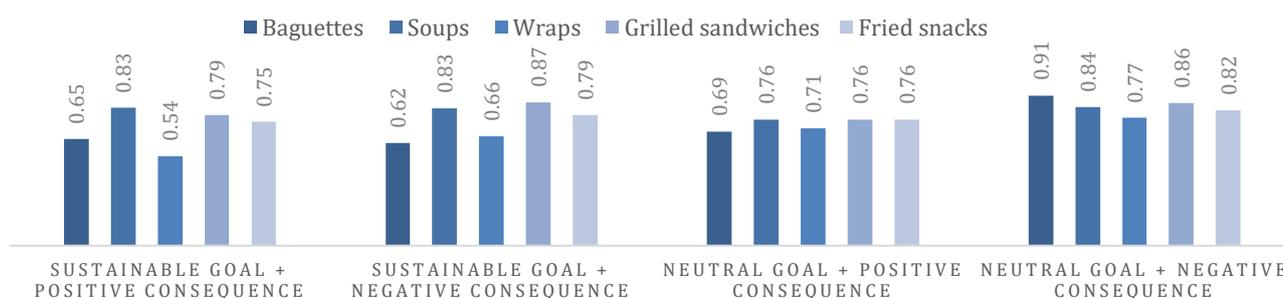


Figure 7 Proportion of types of lunch (vegetarian = 1 /meat = 0) per and in total per condition

A binomial logistic regression was performed to test the effectiveness of the manipulation texts (i.e. goal setting and consequence) on the dichotomous variable picked lunch in round five. No significant results were found in the binomial logistic model $\chi^2(3)=0.768$, $p=.857$. Goal setting, $p=.411$, nor consequence $p=.740$ predicted lunch picked significantly. No significant interaction effect was found, $p=.489$. Means and standard deviations of the accumulated lunches picked are displayed in table 3.

Table 3 Means and standard deviations of experimental variables for four conditions of the experiment

	Sustainable goal setting, positive consequence (N=48)		Neutral goal setting, positive consequence (N=53)		Sustainable goal setting, Negative consequence (N=55)		Neutral goal setting, negative consequence (N=44)		Total (N=200)	
	M	SD	M	SD	M	SD	M	SD	M	SD
Intention round 1	73.78	19.87	68.64	28.31	61.96	27.46	67.86	27.22	67.93	26.19
Intention round 2	77.33	19.28	74.01	24.79	69.85	22.55	70.39	23.66	72.91	22.75
Intention round 3	73.22	20.61	71.55	25.94	67.42	22.53	64.73	26.75	69.36	24.10
Intention round 4	72.66	22.98	68.73	27.76	70.50	22.96	67.06	26.23	69.77	24.99
Intention round 5	72.80	26.25	69.82	27.75	70.10	21.50	66.97	24.91	69.98	25.11
Anticipated Emotion round 1	59.06	17.43	58.49	20.27	59.83	17.02	59.67	14.15	59.24	17.39
Anticipated Emotion round 2	63.31	16.53	62.33	18.64	61.34	15.86	61.56	12.83	62.13	16.15
Anticipated Emotion round 3	61.66	18.16	60.53	17.97	61.69	15.42	60.61	15.32	61.13	16.69
Anticipated Emotion round 4	59.69	21.29	61.72	19.45	63.68	16.62	61.52	16.53	61.71	18.52
Anticipated Emotion round 5	60.30	20.77	62.09	18.55	63.14	16.70	61.66	17.76	61.85	18.37
Accumulated Living Trees	3.56	1.29	3.69	1.22	3.77	1.15	4.20	0.93	3.79	1.18
Habit strength T=0	42.91	23.89	44.44	24.02	39.39	22.97	48.84	24.16	43.65	23.79
Habit strength T=6	42.08	24.98	40.45	22.51	39.36	22.73	44.92	21.40	41.53	22.87

Provided consequence on habit strength of meat consumption (hypothesis 2). Two linear regressions were run to test the effect of provided consequences (dead tree versus living tree) on habit strength of meat consumption: The first linear regression was run with Accumulated Living Trees as continuous independent variable. The Accumulated Living Trees in the virtual garden did not significantly predict habit strength of meat consumption, $F(1, 199) = 2.990$, $B = -2.375$, $p = .085$.

The second linear regression was run with Lunch_{round 5} as dichotomous independent variable. The fifth lunch (meat or vegetarian) did not significantly predict the habit strength of meat consumption, $F(1, 199) = 1.505$, $B = -4.783$, $p = .221$.

Difference in habit strength of meat consumption. The difference between Habit Strength of Meat Consumption $T=0$ and $T=6$ were investigated between subjects and within subjects. A paired sample t-test revealed a significant difference between the first ($T=0$) and the second time ($T=6$) habit strength of meat consumption was measured, $t(199) = -2.784$, $p = .006$. The Tree Growing Game elicited a 2.213 decrease (on a 100 points scale) in the mean of habit of meat consumption within all subjects. Means and standard deviations of habit strength of meat consumption are displayed in table 3.

A two-way ANOVA was done to investigate whether there was a difference in change of Habit Strength of Meat Consumption between manipulation messages Communicated Goal and Communicated Consequence. The test revealed a significant effect of Communicated Goal on the difference between habit strength of meat consumption $T=0$ and $T=6$, $F(3, 196) = 5.375$, $p = .021$, partial $\eta^2 = .027$, resulting in a reduced habit of meat consumption in the condition where a neutral goal was communicated. Communicated Consequence did not have a significant effect on the change of the habit strength of meat consumption, $F(3, 196) = .083$, $p = .774$. No interaction effect was found, $F(3, 196) = .057$, $p = .812$.

A paired sample t-test was done to investigate whether there was a difference in change of Habit Strength of Meat Consumption between Communicated Neutral Goal and Communicated Sustainable Goal. The manipulation messages with a Communicated Neutral Goal showed a significant difference between Habit Strength of Meat Consumption $T=0$ and $T=6$. The intervention message that communicated a neutral goal showed a 3.955 decrease (on a 100 points scale) in the mean of habit of meat consumption, $t(96) = -3.214$, $p = .002$, Cohen's $d = 0.369$. The manipulation messages with a Communicated Sustainable Goal did not show a significant difference between Habit Strength of Meat Consumption $T=0$ and $T=6$, $t(96) = -0.445$, $p = .657$.

Communicated Consequence on Anticipated Emotion (hypothesis 3). An ANOVA was performed, five times for each round, to test the predictability of Communicated Consequence (positive versus negative) on the anticipated emotion of picking a vegetarian lunch per round. No significant results were found of the communicated consequence on mean anticipated emotion, results are displayed in table 3. The communicated consequence in the intervention message did not significantly predict the anticipated emotion about picking a vegetarian lunch in any of the rounds.

Goal setting on intention (hypothesis 6). An ANOVA was performed, five times for each round, to test the predictability of Communicated Goal (sustainable versus neutral) on the intention to pick a vegetarian lunch per round. No significant results were found of the communicated goal on mean intention, results are displayed in table 4. The communicated goal in the intervention message did not significantly predict the intention to pick a vegetarian lunch in any of the rounds.

Table 4 F statistics and p-values of ANOVA for Communicated Consequence on Anticipated emotion and Communicated Goal on Intention

Round	Communicated Consequence on Anticipated emotion		Communicated Goal on Intention	
	F(1,198)	p	F(1,198)	p
1	0.033	.855	3.009	.084
2	0.016	.899	2.912	.090
3	0.219	.640	3.267	.072
4	0.003	.954	0.209	.648
5	0.002	.967	0.505	.478

Habit, intention and anticipated emotion on behaviour (hypotheses 1, 4 and 7). To test the predictability of habit, intention and anticipated emotion on picked lunch in each round, five binominal regressions were performed for each round, for each condition. For each round, Habit Strength of Meat Consumption $T=0$ was used as an independent variable. For the other two independent variables, the intention and anticipated emotion were used per round that belonged to that round (E.g. Intention_{round 3} and Anticipated Emotion_{round 3} for Picked Lunch_{round 3}). Out of twenty condition (1,2,3,4) x round (1,2,3,4,5) combinations, four showed to have a statistically significant model: the condition with an intervention message with a communicated sustainable goal and a positive consequence in round 4, an intervention message that communicated a neutral message and a positive consequence in round 1, and an intervention message that communicated a neutral goal and negative consequence in round 1 and 2 (Table 5). In these cases, the habit strength of meat consumption, the intention to pick a vegetarian lunch, and the anticipated emotion to pick a vegetarian lunch, significantly predict behaviour, compared to no independent variables. In table 6, more specific results of the logistic regression are displayed.

Table 5 Omnibus results of logistic regression of Habit, Intention and Anticipated Emotion on Behaviour per condition, per round.

Round	Sustainable +Positive		Sustainable + Negative		Neutral Goal + Positive		Neutral Goal + Negative	
	$\chi^2(3)$	p	$\chi^2(3)$	p	$\chi^2(3)$	p	$\chi^2(3)$	p
1	3.881	.275	0.349	.951	<u>10.055</u>	<u>.018</u>	<u>19.53</u>	<u>.000</u>
2	0.209	.976	5.479	.140	0.42	.936	<u>14.625</u>	<u>.002</u>
3	0.11	.991	6.773	.079	3.04	.385	1.489	.685
4	<u>9.324</u>	<u>.025</u>	2.567	.463	2.052	.562	1.484	.686
5	4.197	.241	2.657	.448	2.239	.524	1.565	.667

Note. Significant values are underlined

Table 6 B-values and p-values of the binominal logistic regression of Habit, Intention and Anticipated Emotion on Behaviour, per condition, per round.

	Sustainable Goal + Positive Consequence						Sustainable Goal + Negative Consequence						Neutral Goal + Positive Consequence						Neutral Goal + Negative Consequence					
	Habit		Intention		Ant. Emotion		Habit		Intention		Ant. Emotion		Habit		Intention		Ant. Emotion		Habit		Intention		Ant. Emotion	
	B	p	B	p	B	p	B	p	B	p	B	p	B	p	B	p	B	p	B	p	B	p	B	p
1	-0.035	.088	-0.005	.786	-0.019	.528	0.002	.877	0.005	.631	-0.006	.717	<u>-0.049</u>	<u>.006</u>	-0.004	.792	-0.038	.196	0.162	.297	-0.273	.161	1.404	.199
2	0.003	.902	0.010	.654	-0.001	.972	-0.005	.763	-0.002	.885	<u>-0.045</u>	<u>.041</u>	0.011	.526	0.004	.863	0.000	.995	<u>-0.104</u>	<u>.01</u>	<u>-0.079</u>	<u>.042</u>	-0.063	.219
3	0.005	.766	0.000	.986	0.006	.783	<u>0.040</u>	<u>.024</u>	-0.008	.573	0.016	.429	-0.006	.694	0.001	.937	0.029	.251	-0.020	.28	-0.011	.547	0.009	.756
4	0.012	.613	0.012	.606	0.056	.082	-0.023	.147	-0.003	.807	-0.021	.281	-0.025	.165	-0.010	.681	0.001	.965	-0.015	.532	-0.009	.68	0.026	.426
5	0.007	.731	-0.029	.127	0.052	.085	-0.021	.188	0.010	.409	-0.024	.258	-0.004	.816	0.030	.184	-0.037	.238	0.021	.351	-0.002	.926	0.024	.401

Note. Significant values are underlined.

Round 1. When the participant had gotten a manipulation messages with Communicated Neutral Goal and Positive consequences, habit strength of meat consumption significantly predicted the lunch picked in the first round, $p=.006$. This indicated that an increase in habit strength of meat consumption lowered the chance for someone to pick a vegetarian lunch, each increase of habit would lower the odds for someone to pick a vegetarian lunch by 0.952 ($\text{Exp}(B)=0.952$).

Round 2. When the participant had gotten a manipulation messages with Communicated Neutral Goal and Negative consequences, the habit strength of meat consumption significantly predicted the lunch picked in the second round, $p=.010$. This indicated that an increase in habit strength of meat consumption lowered the chance for someone to pick a vegetarian lunch, each increase of habit would lower the odds for someone to pick a vegetarian lunch by 0.901 ($\text{Exp}(B)=0.901$).

When the participant had gotten a manipulation messages with Communicated Sustainable Goal and Negative consequences, the anticipated emotion of picking a vegetarian lunch significantly predicted the lunch picked in the second round, $p=.041$. This indicated that an increase in anticipated emotion (anticipated emotion becomes more positive) lowered the chance for someone to pick a vegetarian lunch, each increase of anticipated emotion would lower the odds for someone to pick a vegetarian lunch by 0.956 ($\text{Exp}(B)=0.956$).

When the participant had gotten a manipulation messages with Communicated Neutral Goal and Negative consequences, the intention of picking a vegetarian lunch significantly predicted the lunch picked in the second round, $p=.042$. This indicated that an increase in intention to pick a vegetarian lunch lowered the chance for someone to pick a vegetarian lunch, each increase of intention would lower the odds for someone to pick a vegetarian lunch by 0.924 ($\text{Exp}(B)=0.924$).

Round 3. When the participant had gotten a manipulation messages with Communicated Sustainable Goal and Negative consequences, the habit strength of meat consumption significantly predicted the lunch picked in the third round, $p=.024$. This indicated that an increase in habit strength of meat consumption increased the chance for someone to pick a vegetarian lunch, each increase of habit would increase the odds for someone to pick a vegetarian lunch by 1.041 ($\text{Exp}(B)=1.041$).

Habit, mean intention and mean anticipated emotion on behaviour. In addition, the predictability of habit, intention and anticipated emotion on the total vegetarian lunches was tested with a three-way ANOVA. No significant effect of Habit Strength of Meat Consumption ($T=0$), Mean Intention and Mean Anticipated Emotion was found on the Accumulated Picked Lunches, $F(199)=.810$, $p=.490$.

Bivariate Pearson correlations were run for each round of intention to pick a vegetarian lunch, anticipated emotion of picking a vegetarian lunch and habit strength of meat consumption. Intention to pick a vegetarian lunch and anticipated emotion of picking a vegetarian lunch had a significant positive correlation with each other in each round ($p < .001$). Both intention to pick a vegetarian lunch and anticipated emotion for picking a vegetarian lunch were negatively correlated with habit strength of meat consumption T=0 and T=6 ($p < .001$). Correlations per variable, per round are displayed in table 7.

Table 7 Correlations between anticipated emotion, intention and habit strength (all are significant)

		anticipated emotion					Habit strength	
Round		1	2	3	4	5	T=0	T=6
Intention	1	.499	.364	.409	.408	.463	-.429	-.419
	2	.394	.348	.434	.410	.427	-.402	-.410
	3	.401	.396	.364	.384	.392	-.392	-.407
	4	.466	.377	.435	.489	.504	-.410	-.473
	5	.462	.335	.353	.476	.539	-.381	-.415
Habit strength	T=0	-.531	-.416	-.444	-.481	-.468		
	T=6	-.507	-.418	-.452	-.482	-.492		

Provided Consequence on Anticipated emotion (hypothesis 5). To test to the predictability of the provided consequence (positive, i.e. living tree/negative, i.e. dead tree) on anticipated emotion in each round, four linear regressions were performed. No significant results were found of the provided consequences on anticipated emotions in each round, $F(1, 199)=0.035, p=.853$ (consequence after round 1 on anticipated emotion of round 2), $F(1, 199)=.244, p=.622$ (consequence after round 2 on anticipated emotion of round 3), $F(1, 199)=1.829, p=.178$ (consequence after round 3 on anticipated emotion of round 4), $F(1, 199)=3.651, p=.067$ (consequence after round 4 on anticipated emotion of round 5).

Sequence of anticipated emotion of picking a vegetarian lunch through five rounds. A

repeated measures ANOVA was performed to see whether there was a significant change between the five rounds within all subjects of anticipated emotion. Wilks' Λ was used as test statistic. The model was found to be significant, $F(4,196)=4.633$, $p=.001$, partial $\eta^2=0.086$, Wilks' $\Lambda=.914$.

A significant difference between round 1 and round 2 of the Tree Growing Experiment, $F(1, 199)=10.942$, $p=.001$, partial $\eta^2=.052$, the anticipated emotion of picking a vegetarian lunch increased (i.e. became more positive) in the second round, compared to the first round (figure 8). No significant change was found between the other rounds.

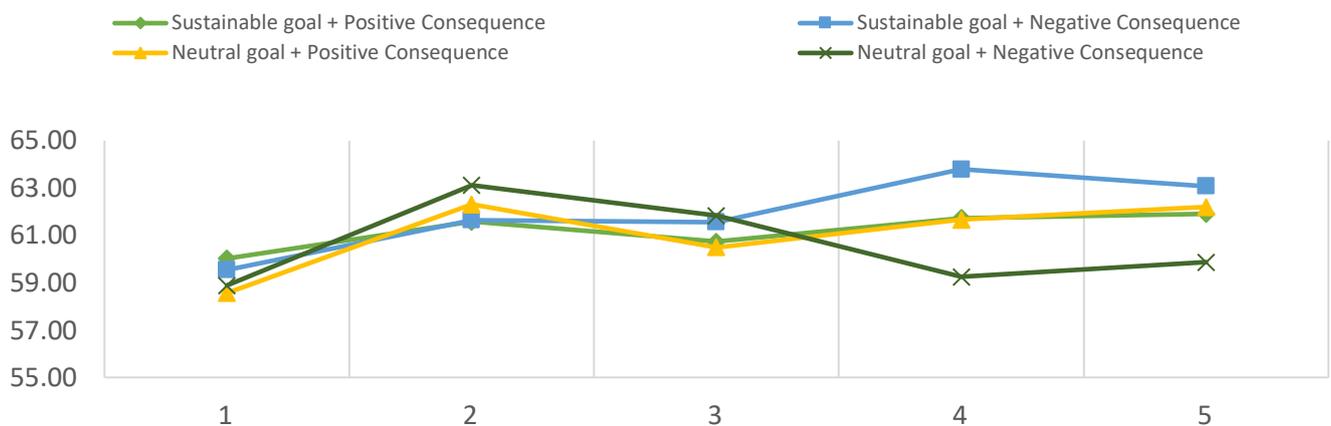


Figure 8 Course of anticipated emotion of picking a vegetarian lunch through five rounds. The first and second round differ significantly.

To investigate if there was an interaction effect between communicated goal and round of the game, per communicated consequence (positive or negative), a three-way mixed model was performed. No significant interaction effect was found between communicated goal and round of the game when a negative consequence was communicated, $F(4,94)=0.214$, $p=.930$, Wilks' $\Lambda=.991$. No significant interaction effect was found between communicated goal and round of the game when a positive consequence was communicated, $F(4,94)=1.046$, $p=.387$, Wilks' $\Lambda=.958$.

Sequence of anticipated emotion of not picking a vegetarian lunch through five rounds. A

repeated measures ANOVA was performed to see whether there was a significant change between the five rounds in the anticipated emotion of not picking a vegetarian lunch. The model was found to be significant, $F(4,196)=4.357$, $p=.002$, partial $\eta^2=.082$, Wilks' $\Lambda=.918$

A significant difference between round 1 and round 2 of the Tree Growing Game was found, $F(1, 199)=11.215$, $p=.001$, partial $\eta^2=.053$, the anticipated emotion of not picking a vegetarian lunch decreased (i.e. became more negative) in the second round, compared to the first round (Figure 9). No significant change was found between the other rounds.

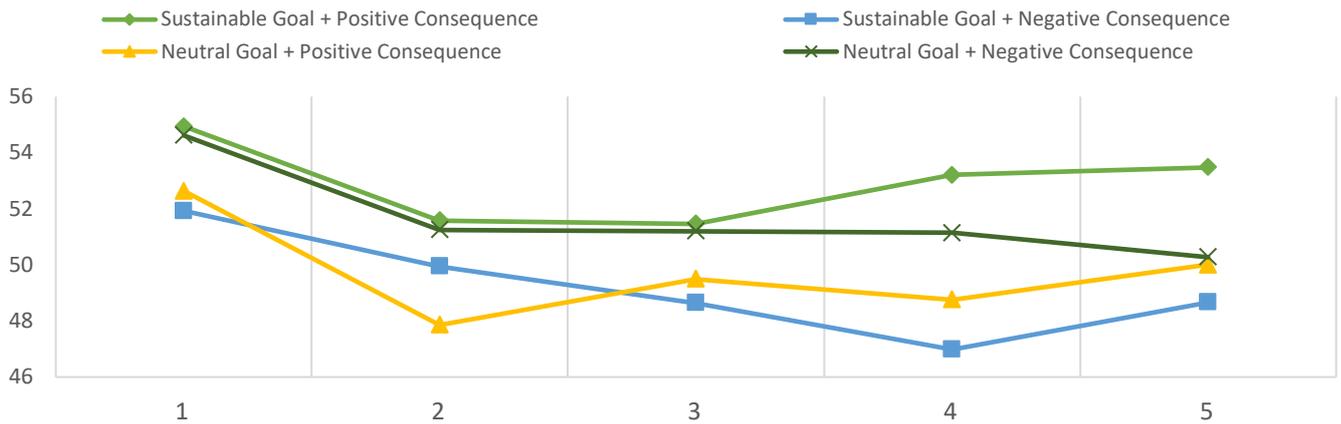


Figure 9 Course of anticipated emotion of not picking a vegetarian lunch through five rounds. The first and second round differ significantly.

Sequence of intention to pick a vegetarian lunch through five rounds. A repeated measures ANOVA was performed to see whether there was a significant change between the five rounds within all subjects of intention. The model was found to be significant, $F(4,196)=4.244$, $p=.003$, partial $\eta^2=0.080$, Wilks' $\Lambda=.920$.

A significant difference between round 1 and round 2 of the Tree Growing Game was found, $F(1, 199)=13.555$, $p<.0001$, partial $\eta^2=.064$, the intention of picking a vegetarian lunch increased in the second round, compared to the first round. Another significant difference was found between round 2 and round 3 of the Tree Growing Game, $F(1, 199)=10.333$, $p=.002$, partial $\eta^2=.049$, the intention of picking a vegetarian lunch decreased in the second round, compared to the first round (figure 10). No significant change was found between the other rounds.

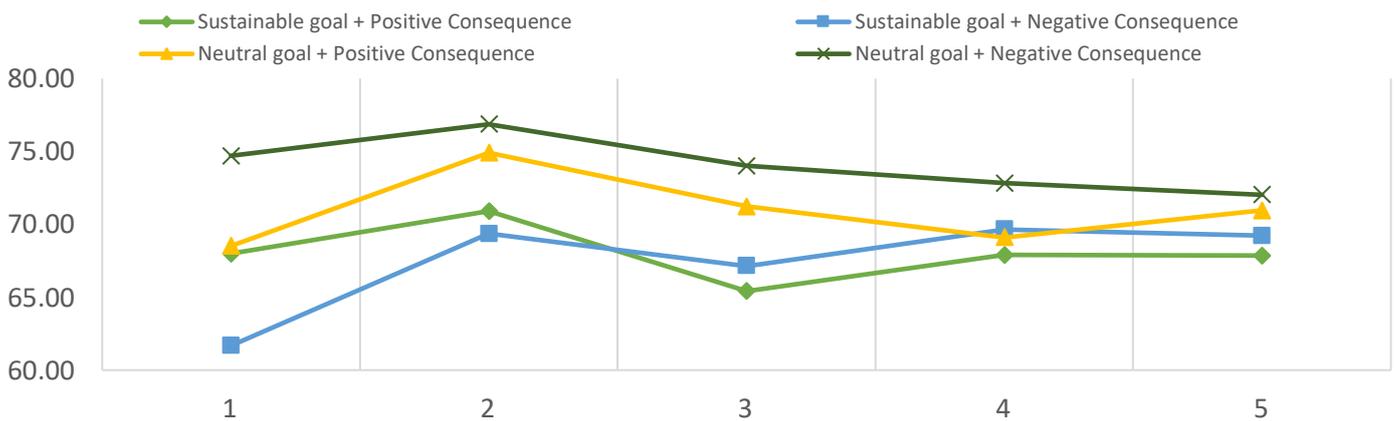


Figure 10 Course of intention to pick a vegetarian lunch through five rounds. The first and second round, and the second and the third round differ significantly.

Lunches predicting lunches. Logistic regressions were run to test whether a picked lunch in one round would predict the picked lunch in the next round. A significant results was found for lunch round 2 on lunch round 3, $\chi^2(1)=16.489$, $B=-1.523$ $p<.001$, indicating that a vegetarian lunch picked in round 2 decreased the odds for a participant to pick a vegetarian lunch in the third round by 0.218 ($\text{Exp}B=0.218$). No significant results were found for lunch round 1 on lunch round 2, $\chi^2(1)=2.799$, $B=-.643$ $p=.090$, lunch round 3 on round 4, $\chi^2(1)=.002$, $B=-.018$ $p=.982$, and lunch 4 on lunch round 5, $\chi^2(1)=.818$, $B=-.386$ $p=.357$.

Sum of previous lunches predicting next lunch. A logistic regression was run to test whether the accumulation of lunches could predict the next lunch (e.g. accumulated lunches of round 1 and 2 on lunch 3). The sum of lunches picked in round 1 and 2 (0 to 2, i.e. 0 being only meat lunches, 2 being only vegetarian lunches) significantly predicted the lunch picked in round 3, $\chi^2(1)=15.325$, $B=0.928$ $p<.001$. The more vegetarian lunches picked in round 1 and 2 accumulated, the odds of someone picking a vegetarian lunch in the third round increased by factor 2.531 ($\text{Exp}B=2.531$).

No significant results were found on the sum of lunches picking in round 1, 2, and 3 on the lunch picked in round 4, $\chi^2(1)=0.385$, $B=0.126$ $p=.532$. The sum of lunches picked in round 1, 2, 3 and round 4 significantly predicted the lunch picked in round 5, $\chi^2(1)=16.293$, $B=0.754$ $p<.001$. The more vegetarian lunches picked in round 1, 2, 3 and 4 accumulated, the odds of someone picking a vegetarian lunch in the fifth round increased by factor 2.125 ($\text{Exp}B=2.125$).

Discussion

This study aimed to determine the antecedents of behaviour with the use of sound theory, to develop an empirically robust intervention that reduces meat consumption. The study was guided by the main research question “What are the determinants behind behaviour and how can these be addressed to change behaviour”. The literature study resulted in seven hypotheses, tested in the Tree Growing Game experiment.

Habit. Habit strength of default behaviour (i.e. eating meat) lowered the change for someone to perform alternative behaviour (i.e. picking a vegetarian lunch), in the first two rounds of the game, when a neutral goal was communicated, offering partial support for the first hypothesis. Oddly, in the third round of the game, when a sustainable goal and a negative consequence was communicated, a stronger habit strength of meat consumption slightly increased the odds for someone to pick a vegetarian lunch.

Providing a negative consequence (i.e. one or multiple dead trees) did not affect the habit strength of default behaviour, providing no support was found for the second hypothesis. In the

conditions where a neutral goal was communicated, habit strength of meat consumption had decreased after the Tree Growing Game, compared to the first measurement before the game.

Anticipated emotion. The communication of a positive consequence before each round of the Tree Growing Game did not influence the positive anticipated emotion to perform alternative behaviour. Thus, no support was found for the third hypothesis, describing that the promise of a positive consequence when alternative behaviour is performed, increases the positive anticipated emotion of that alternative behaviour

Anticipated emotion becoming more positive did not increase the chance for someone to perform alternative behaviour, providing no support was found for the fourth hypothesis. Surprisingly, an increase in anticipated emotion regarding alternative behaviour, in the second round of the Tree Growing Game, when a sustainable goal with a negative consequence was communicated, increased the chances for someone to perform default behaviour.

Providing a positive consequence after the performance of alternative behaviour in one round of the game did not increase the positive emotion regarding that alternative behaviour in the next round, offering no support for the fifth hypothesis. The positive anticipated emotion to perform alternative behaviour increased in the second round of the Tree Growing Game, compared to the first round. The anticipated emotion of not picking a vegetarian lunch decreased in the second round of the game, compared to the first. Anticipated emotion did not change significantly after that.

Intention. Communicating a goal that describes someone to behave sustainably by picking a vegetarian lunch did not increase the intention to pick a vegetarian lunch, providing no support was found for the sixth hypothesis.

In the second round of the Tree Growing Game, when a neutral goal was communicated with a negative consequence, intention to perform alternative behaviour increased the chances for someone to perform default behaviour. This finding opposes the seventh hypothesis, offering no support for the hypothesis that a stronger intention of behaviour increases the chance of the performance of that behaviour. The intention of picking a vegetarian lunch increased in the second round of the game, compared to the first. Intention decreased in the third round, compared to second. Intention did not change significantly after that.

Propositions of the present study.

This thesis held two propositions. The first one was that the combination of habit strength, intention and anticipated emotion together would predict behaviour. The second proposition was that

the communication of a goal and a consequence before the execution of behaviour, and providing a consequence after behaviour, repeatedly, would change default behaviour towards alternative behaviour. Both propositions will be discussed, and implications will be provided.

Antecedents of behaviour. Two perspectives on the antecedents of behaviour can be distinguished. One perspective views intention as proximal determinant of behaviour, based on the Theory of Planned Behaviour (Ajzen, 1991). Some add anticipated emotion (e.g. Perugini and Bagozzi, 2001) or habit strength (e.g. Rees, et al., 2018) as moderators to intention. Nevertheless, intention remains the proximal determinant and thus maintains the assumption that cognitively deliberate processes mostly determine behaviour. The other perspective views behaviour as determined by mostly unconscious processes. In this view, automatic processes such as habit (e.g. Aarts & Dijksterhuis, 2000; Oullette & Wood, 1998) and emotion (e.g. Damasio, 1994; Neal et al., 2006) determine behaviour.

The present study placed itself closer to the latter perspective, as it proposed that multiple antecedents, varying in automaticity predict behaviour. Habit strength, anticipated emotion and intention predicted behaviour three times (i.e. two times in round 1, one time in round 2) when a neutral goal was communicated and one time (in round 3) when a sustainable goal with a positive consequence was communicated. Although no full support was found, the results do point into the direction of the proposition that behaviour is determined by multiple antecedents, varying in automaticity.

Indications were found that habit strength, anticipated emotion and intention jointly predict behaviour in some cases. Nevertheless, when looking at the individual effects of the three determinants on behaviour, some counterintuitive findings were discovered. That is, the intention and anticipated emotion of picking a vegetarian lunch decreased the odds for someone to pick a vegetarian lunch in two cases. Habit strength of meat consumption increased the odds for someone to pick vegetarian in one case. A methodological limitation of the presentation of the lunches could explain these findings. It was not possible to combine the randomisation of lunches between rounds, while simultaneously allowing the experiment to provide consequences tailored to the participant's behaviour for five rounds.

A reason that could explain the results of anticipated emotion on behaviour could have to do with the way anticipated emotion was induced and measured in the present study. Subliminally priming anticipated emotion has shown to be effective in increasing willingness to perform specific tasks (Custers & Aarts, 2005). In hindsight, the present study might have created consciousness about the participant's anticipated emotion because of three reasons. Firstly, the communicated

consequences were worded in explicit positive and negative terms (i.e. living tree versus dead tree). Secondly, anticipated emotion was measured directly after the communicated consequence for five rounds. Thirdly, the scale that was used to measure anticipated emotion is commonly used to indicate strong emotions, such as pain (Belville et al., 2005). Whereas pain can be rather distinctive, the anticipated emotion of picking a vegetarian lunch can plausibly be less prominent. Taken together, this could have made the anticipated emotion of the participants conscious to the extent that the emotions became intentions, and therefore did not act as expected. The intention to perform a behaviour is not the same as actually performing a behaviour, as deliberately explained by the intention-behaviour gap (Orbell, Hodgkins, & Sheeran, 1997; Sheeran, Orbell, & Trafimow, 1999).

This intention-behaviour gap could also be an explanation for the lack of predictability of intention on behaviour in this study. The sequence of both intention and anticipated emotion only changed in the first rounds of the game. This could point into the direction that more conscious thoughts become less important in predicting behaviour after multiple repetitions. This is in line with findings within the field of habits, saying that behaviour such as meat consumption happens without intentions or deliberate thought (e.g. Rees et al., 2018; Aarts & Dijksterhuis, 2000; Oullette & Wood, 1998).

Habit strength did indeed affect behaviour in the first two rounds of the game when a neutral goal was communicated. This is according to the expectation that habit strength of meat consumption has more effect at the beginning of the intervention. Nevertheless, one counterintuitive result was found that needs to be discussed. In the third round, habit strength of meat consumption slightly increased the chance for someone to pick a vegetarian lunch in when a sustainable goal with negative consequence was communicated. One plausible explanation for this could have to do with variety seeking. The lunches with meat and the vegetarian lunches looked rather similar. This could have caused participants with a lower habit strength of meat consumption to want to try out a vegetarian lunch and participants that just had a vegetarian lunch want to pick something with meat. This is in line with the results that showed that a vegetarian lunch picked in the second round increased the odds for someone to pick a lunch with meat in the third round. A second reason could be that habit strength weakened over the rounds, and therefore caused participants to pick a vegetarian lunch. Nevertheless, this is hard to prove with the findings of this study.

Communicated consequence and goal. The communication of a consequence did not affect behaviour. The consequence would be provided, depending on whether the participant would behave sustainably or not. There is a possibility that the participant did not attribute sustainable behaviour to the type of lunch they would pick. This could have to do with a lack of understanding of the term

sustainability or a lack of understanding of what sustainable behaviour entails. A lack of understanding seems less likely, as all participants studied at Wageningen University that is known for its focus on climate change and sustainability. Also, participants reported caring about climate to a large extent. Because of this, it is more likely that the participants might have felt as if they already behave sustainably and therefore did not feel like the lunch they would pick in the experiment would affect their sustainable behaviour.

The communication of a sustainable goal was expected to increase the chance for someone to pick a vegetarian lunch. No support was found for this expectation, telling people to behave sustainably by picking a vegetarian lunch does not affect the lunch they pick. One reason for this might have to do with the tone of voice of the sustainable consequence. People in these conditions were explicitly told to behave sustainably and to pick a vegetarian lunch. This might have caused reactance among the participants in these conditions. Reactance can occur when someone feels as if their freedom of choice is eliminated or threatened (Brehm, 1966). The explicit wording of the sustainable goal, might have given the participants a feeling of restriction and leading them to behave opposite to what was told.

Surprisingly, the condition with a communicated neutral goal did affect both behaviour and habit strength of meat consumption. When a neutral consequence was communicated, more vegetarian lunches were picked compared to the sustainable goal and habit strength of meat consumption had lowered after the Tree Growing Game. Although the neutral goal did not explicitly describe what to do other than to pick a lunch, it was not wholly neutral because of the communicated consequence in each message. Despite the lack of effect of communicated consequence on behaviour, both messages with a negative and a positive consequence had an if-then formulation. This if-then formulation of goals, also known as implementation intentions, has shown to be successful in behaviour change interventions (Brug et al., 2006; Gollwitzer, 1999). Contrary to the present study, implementation intentions are typically formulated by the participants themselves. Nevertheless, the if-then formulation might have still had an effect on behaviour in this study, because the sketching of a hypothetical situation by if and the consequences communicated by then has shown to increase intentions to reduce meat consumption in other studies (Bertolotti, 2016; 2019; Carfora et al., 2019). The reactance in the sustainable goal condition could have caused the if-then formulation only to affect behaviour in the neutral goal conditions.

Provided consequences. In the second part of the intervention, participants would get a consequence based on the type of lunch picked. It was expected that positive consequences would increase the performance of alternative behaviour and negative consequences would decrease the

performance of default behaviour. No support was found for this. Punishments did not lower habit strength of meat consumption and rewards did not increase anticipated emotion, leading to no differences in picked lunch that consequence could account for. A plausible explanation could be that the effect of the intervention might have been weakened because of the overall preference for vegetarian lunches among the participants. The population tested in this study showed characteristics of flexitarians, because of their weekly meat consumption, care about health, animals and the climate (Voordouw & Dagevos, 2013). This might have caused the participants to have a more moderate habit strength of meat consumption, making them less susceptible to the provided consequences. A second plausible explanation could be that the time period of the intervention was too short. For new habits to form, a repetition of rewarding the alternative behaviour is necessary for an extended period (e.g. Baumeister, 2007; Neal et al., 2006). The last explanation could be that people did not care about the trees, and therefore did not care for the consequences. Nevertheless, debriefing suggested that this is not plausible. Some participants reported with a tone of pride that they had five living trees, some reacted disappointed when a dead tree was provided. Besides, participants reported that they liked trees and nature to a large extent, making it unlikely that they did not care for the trees in the game.

Limitations and future research

A summary of limitations can be provided in order to provide suggestions for further research. First of all, the experiment was conducted among students from Wageningen University. Students from Wageningen University are known for their awareness of climate change and sustainability as many studies and courses address these issues. Consequently, students are environmentally conscious and already consume less meat compared to other populations. This likely affects the habit strength of meat consumption and thus, the effectiveness of the intervention. Future research might want to take this and other factors of influence on habit strength of meat consumption into account.

A second limitation of this study was that the neutral goal condition was not entirely neutral. For this research, it was decided to combine the communication of goals as well as consequences. Unfortunately, with this decision, an entirely neutral goal setting was not possible. Further research could split up the goal communication and the consequence communication to explore the effectiveness of both.

The third limitation has to do with the definition and implication of sustainability. To prevent bias, it was also decided not to explain sustainability or sustainability concerning meat consumption. Nevertheless, no control question was used to check the participant's definition of sustainability. This could have affected the participant's interpretation of the communicated consequence and therefore, on the intervention. Future research could control for knowledge on sustainability.

The last limitation is that the explicit priming and measuring of anticipated emotion unintentionally made the emotions more conscious. Although it aided in testing the hypotheses, it might have also interfered with the effectiveness of the intervention. Future research could focus more on automatic and unconscious emotions.

By adding habit strength, anticipated emotion and intention as linear determinants of behaviour, this study has attempted to contribute to the ongoing debate between the two perspectives of the antecedents of behaviour. With the investigation of these linear determinants through repetitive feedback loops, this study distinguished itself from other studies. The results of this study suggest that in the repetition of low involvement behaviour, cognitive processes become less prominent, and therefore automatic processes become more apparent. Not all expectations were found, and there is room for improved. Opposed to what was expected, communicating a neutral goal had more effect on behaviour than communicating a sustainable goal. So, until further research shows otherwise, this study concludes that people will do as told, but not when they are told what to do.

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