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The Effect of Digital Nudging on Resistance to a Sustainable Innovation

A study about the effect of digital nudging in the form of priming and the combination of priming with goal setting, on reducing emotional, cognitive, and behavioral resistance to the sustainable innovation of cultivated meat, moderated by pro-environmental attitudes.

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Abstract

A quantitative study (n=318) which shows the effective influence of digital nudging, in the form of priming and priming combined with goal setting on reducing resistance to a sustainable innovation, and examines if pro-environmental attitudes has a moderating role. The sustainable innovation used in this study is cultivated meat, as it is a more sustainable alternative compared to conventional meat. Reducing the resistance against sustainable innovations is important for both the environmental as well as the economic well-being. To capture the multifaceted nature of resistance, this study made a distinction between three dimensions: emotional, cognitive and behavioral resistance. This study conducted an online survey where it was examined whether priming and priming combined with goal setting had more effect to reduce resistance than the participants in the baseline condition. The study showed in a MANOVA analysis that indeed priming (condition 1) had significant effect on reducing both emotional and cognitive resistance, and that the combination of priming and goal setting (condition 2) even had a reducing effect on all three dimensions of resistance. Despite the significant findings this study also addresses certain limitations and needs for further research. In addition, the hypotheses of the expected moderation effect of pro-environmental attitudes both had to be rejected, as resulted from a PROCESS Macro analysis. Only the interaction effect in both condition 1 and 2, on emotional resistance was significant, however the effect was contrary to what was expected in the hypotheses, as the higher the PEA was, the less strong the interaction effect was.

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1: Introduction

Over the last few years, sustainability has become increasingly important in society due to population growth, increased food consumption, and climate change, which can all negatively impact the environment (Bernyte, 2021). According to research from Wageningen University, the Netherlands consumes around 39kg of conventional meat per person, which significantly contributes to negative environmental impacts (Dagevos, 2020; Quevedo-Silva & Pereira, 2022). To reduce climate change, greenhouse gas emissions must be significantly reduced (UNFCCC, 2015). One promising area in more sustainable options is cultivated meat, which offers significant benefits including water usage reductions (by 82-96%), less energy consumption (by 7-45%), and less greenhouse gas emissions (by 78-96%) (Da Silva & Semprebon, 2021; Tuomisto & De Mattos, 2011). Cultivated meat is developed through the use of biotechnology in a laboratory setting, where satellite cells are extracted from plants or animals and then multiplied (Letti et al., 2021).

Even though consumers recognize the importance of sustainable innovations, the awareness does not always result in adoption (Ozaki, 2011). Sustainable innovations often face resistance from consumers (Pichert & Katsikopolous, 2008). Overcoming the resistance against cultivated meat is important to improve both the economic well-being as well as the environmental impact (Dibrov 2015; Ram & Sheth, 1989). Nevertheless, there is still limited research done on how to reduce consumer resistance to the sustainable innovation of cultivated meat (Huang et al., 2021). Resistance to innovation is defined as "the resistance offered by consumers to an innovation, either because it poses potential changes from a satisfactory status quo or because it conflicts with their belief structure" (Ram & Sheth, 1989, p.6). Resistance is a complex phenomenon with various conceptualizations. For example, it can be conceptualized according to the three psychological dimensions: emotional, cognitive, and behavioral resistance (Knowles & Riner, 2007; Ngafeeson & manga, 2021). Despite significant results in psychology, the three dimensions of resistance have not been used collectively as a multifaceted construct (Grubber et al., 2021).

A tool which can help to overcome the resistance to an innovation is the nudging strategy. Nudging is defined as "Any aspect of the choice architecture that alters people's behavior predictably without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008, p.6). A specific type of nudging is digital nudging, which is defined as: "the utilization of user-interface design elements to influence individuals' behavior in digital choice environments" (Weinmann et al., 2016, p.433). Another specific

type of nudging, green nudging, can enhance this technique by guiding consumers toward more sustainable choices (Akbulut-Yuksel and Boulatoff, 2021). This study will build upon the existing literature of Stryja et al. (2017) and Stryja and Satzger (2019) to further explore the effect of digital nudging on the resistance against a sustainable innovation, such as cultivated meat. They are the only researchers who examined this effect, meaning limited information is available about the conditions under which digital nudging is proven to be an effective tool (Mertens et al., 2022).

Therefore, the first goal of this study is to examine if digital nudging can influence the consumer's emotional, cognitive, and behavioral resistance to sustainable innovation. Digital nudging exists out of different types, such as default rules, priming, framing, feedback, and goal setting (Berger et al., 2022). In this study, priming and priming in combination with goal setting are utilized, as both are applied prior to the actual decision-making process (Zimmerman et al., 2021). Priming is utilized to provide information to the consumer, which will address the cognitive resistance. In addition, priming is also used to create a fear appeal, which will influence emotional resistance. Furthermore, goal setting is used to influence the behavioral resistance of consumers in the form of commitment. According to Berger et al. (2022), only Abrahamse et al. (2007) combined priming and goal setting, with feedback as a third component. This highlights the potential for examining the combination of priming and goal setting together to reduce resistance, and thereby contribute to the literature.

Furthermore, this study examines if pro-environmental attitudes (PEA) has a moderating effect on the relation between digital nudging and emotional, cognitive, and behavioral resistance to cultivated meat. Pro-environmental attitudes are defined as “the individual’s commitment to protecting the environment” (Flores & Jansson, 2022). In current research, little is known about the direction of the effect of low or high PEA (Bamberg & Möser, 2007).

In conclusion, by building upon the work of Stryja et al. (2017) and Stryja and Satzger (2019) this study aims to extend the literature by examining the effect of digital nudging in reducing resistance to the sustainable innovation, cultivated meat. In addition, this study aims to explore if pro-environmental attitudes (PEA) moderate this effect, and if the moderation effect is stronger for consumers with high PEA compared to those with a low PEA. Therefore, the following research question is conducted:

"What is the effect of digital nudging, in the form of priming and the combination of priming and goal setting, on reducing resistance to the sustainable innovation of cultivated meat, moderated by pro-environmental attitudes?"

1.1 Theoretical relevance of this study

This research contributes to the literature by empirically examining the effect of digital nudging on reducing resistance to the sustainable innovation, cultivated meat. Prior research examined consumer resistance to innovations (Ram & Sheth, 1989), however not many researchers specifically focused on the innovation of cultivated meat (Bryant & Barnett, 2020). Furthermore, the existing research only focused on resistance as a single dimension, thereby overlooking the multi-faceted nature of resistance (Gruber et al., 2021, Ngafeeson & Manga 2021). Therefore, this study will examine the effect of digital nudging on three dimensions, emotional, cognitive, and behavioral resistance.

This study builds upon the findings of Stryja and Satzger (2019) and Stryja et al. (2017), as they are the only researchers who examined the effect of digital nudging on reducing resistance to sustainable innovation. However, they both found the priming technique, a slogan, and a word puzzle, as not significant. Consequently, this study used a different priming technique, namely a video, to explore its effectiveness in reducing resistance against a sustainable innovation. Previous research has not examined the combination of priming and goal setting as digital nudging strategies to reduce resistance to sustainable innovations (Berger et al., 2022). Therefore, this study provides empirical evidence for the significant effect of digital nudging, in the form of priming and priming combined with goal setting, on all three dimensions of resistance.

In current research, little is known about the direction of the effect of pro-environmental attitudes (Bamberg & Möser, 2007). Therefore, by examining the moderating role of PEA, this study expands the understanding of and in which direction the individuals' pro-environmental attitudes interact with digital nudging interventions to reduce resistance. These findings contribute to a more comprehensive understanding of the resistance consumers have against sustainable innovations.

1.2 Managerial relevance of this study

This study provides valuable insights for food/meat companies, by demonstrating the effectiveness of digital nudging, specifically through priming and the combination of priming and goal setting, in reducing the resistance to cultivated meat. Overcoming the resistance

consumers have against a sustainable innovation is also important for preventing market failure and therefore enhancing the economic well-being of companies (Ram & Sheth 1989; Dibrov, 2015). These findings can inform the development of marketing campaigns that use these nudging techniques to promote the consumption of cultivated meat. Future research can examine the effectiveness of digital nudging techniques on other sustainable innovations.

Understanding the moderating effect of pro-environmental attitudes, allows managers to gain a more strategic advantage. Companies can use this knowledge to better segment their target audience and therefore develop a more customized digital nudge. This can lead to a decrease in resistance and to an increase in adoption of such sustainable innovation, and therefore create a better brand reputation.

2: Literature Overview

2.1 Resistance to innovation

Resistance to innovation is defined as: "the resistance offered by consumers to an innovation, either because it poses potential changes from a satisfactory status quo or because it conflicts with their belief structure" (Ram & Sheth, 1989, p.6). There are three factors leading to consumer resistance to innovation: first, the perception of the innovation characteristics; second, the consumer characteristics; and third, the mechanisms of distribution (Ram, 1987).

Resistance to innovation is a multifaceted phenomenon and has been conceptualized in different ways. The Innovation Resistance Theory (IRT) by Ram and Sheth (1989) identifies two barriers to innovation: functional barriers and psychological barriers. First, the functional barriers consist of three components: usage barriers, value barriers, and risk barriers. Secondly, the psychological barriers consist of two elements: The tradition barrier and the image barrier. Recent studies have extended the five proposed barriers by Ram and Sheth (1989) by conducting a mixed-methods approach (Joachim et al., 2018; Talwar et al., 2020). Mani and Chouk (2018) adapted this theoretical framework to align with the evolution of digital technologies and introduced three additional barriers: technological vulnerability barriers, ideological barriers, and individual barriers. Additionally, a third barrier was introduced, namely the emotional barrier, which refers to emotional resistance (Castro et al., 2019).

A different perspective from psychological theory is the ABC theory, which centers around the fundamental psychological processes of Affection, Behavior, and Cognition (Grubber et al., 2021). The ABCs theory of psychology is a fundamental internal process (Lench et al., 2013). In addition, resistance can be seen as an attitudinal outcome, which can specifically be represented by active innovation resistance (AIR) (Heidenreich & Kraemer, 2016; Talke & Heidenreich, 2013). Therefore, one could argue for the utilization of the three dimensions – emotional, behavioral, and cognitive – in understanding resistance to innovation.

There are three sources of resistance: (1) reactance, (2) skepticism, and (3) inertia (Knowles & Rinner, 2007). Emotional resistance, characterized by reactance, indicates a (negative) emotional reaction, such as fear, that an individual can exhibit toward a proposed change (Knowles & Riner, 2007; Bagozzi & Lee, 1999). Cognitive resistance, characterized by skepticism toward a proposed change due to the individual's knowledge, represents a key facet of this study (Knowles & Riner, 2007). Lastly, behavioral resistance is the reaction of an

individual by not changing or behaving in a certain way toward the innovation, similar to inertia.

Resistance to innovations results from both functional and psychological barriers, referring to cognitive barriers (Talke & Heidenreich, 2013). Cognitive resistance is caused by cognitive barriers to adoption, and relates to an individual's evaluation of the innovation's characteristics, for example, expressed as "I don't believe it" (Castro et al., 2019; Ngafeeson & Manga, 2021). Selective cognitive processes, such as exposure, attention, perception, elaboration, and memory have been identified as central mechanisms by which attitudes resist changes (Pomerantz et al., 1995). Most models focus only on cognitive aspects, nevertheless, Castro (2019) and Santos and Ponchio (2021) highlighted the necessity of incorporating the impact of consumer emotions into these models. Emotional resistance arises from the emotional barriers to adoption and is linked to the emotions elicited during the evaluation of innovation, mostly expressed as "I don't like it" (Castro et al., 2019; Ngafeeson & Manga, 2021). Finally, behavioral resistance looks at the actual behavior a person has toward a certain innovation, referring to "I won't do it" (Ngafeeson & Manga, 2021).

Various strategies can help reduce the resistance consumers have against an innovation. The nudging theory is for example a well-known tool to overcome the resistance consumers have (Huang et al., 2021; Mani & Chouk 2017).

2.2 (Digital) nudging

Nudging is a concept within the domain of behavioral economics, which enhances the understanding of human behavior (Thaler & Sunstein, 2008; Neszveda, 2018). A nudge is defined as "any aspect of the choice architecture that alters people's behavior predictably without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008, p.6). Schmidt and Engelen (2020) further elaborate that nudges refer to the purposeful changes and designs in individuals' choice environments, aiming to guide consumers predictably toward a specific direction. However, despite its popularity, critics still argue about the effect sizes of nudging (Hummel & Maedche, 2019; Hansen, 2016; Rebonato, 2012).

Green and Digital nudging

In recent years, research on the nudging theory has significantly progressed across various fields and also extended its influence to the digital realm (Eltahir & Xing, n.d.). Digital nudging is defined as "the utilization of user-interface design elements to influence

individuals' behavior in digital choice environments" (Weinmann et al., 2016, p.433). An interesting aspect of digital nudging is its potential for interconnectedness and personalization through real-time data analysis (Bergram et al., 2022). The literature identifies various digital nudging elements, such as defaults, priming, goal setting, feedback, and framing, aimed at encouraging (sustainable) consumption behavior (Lehner et al., 2016; Berger et al., 2022) Nudging elements that have significant potential to encourage this sustainable behavior are defined as green nudges (Schubert, 2017; Akbulut-Yuksel and Boulatoff, 2021).

This research includes two forms of (green) digital nudging, by examining the effect of priming and the effect of priming combined with goal setting. These two types of nudging are utilized because they both promote sustainable behavior, before the actual consumption behavior (Berger et al., 2022; Zimmermann et al., 2021).

Priming

Recent research has explored the effectiveness of digital nudging, specifically priming, in reducing resistance to sustainable innovations. Two key studies examined this effect. The first study tested digital nudging, including default rules and priming, through a slogan, in an online booking scenario for electric cars, however, this did not yield significant results (Stryja et al., 2017). Furthermore, the study of Stryja and Satzger (2019), did also not find a significant effect of priming on reducing resistance. The non-significant results were attributed to the small sample size (n = 20), and the use of a word puzzle as a priming technique, which was proven to be ineffective in this context (Stryja & Satzger, 2019)

Due to the non-significant findings, this study will incorporate a different priming technique, namely a video. Priming triggers individuals with specific feelings and thoughts through topics, moods, or information (Berger et al., 2022; Mirsch et al., 2017). This process occurs before the actual decision is made, by providing insight into the consequences of choices, thereby aiming to increase the accessibility of related mental information (Wauters & Brengman, 2013). The use of visual stimuli in a prime can help to unconsciously influence decisions (Friss et al., 2007). For instance, Roozen et al. (2021) provided an example of priming, by presenting a webpage focused on environmentally conscious products before directing customers to the shopping page, thereby nudging them towards more sustainable choices. Similarly, Prusaczyk et al. (2021) combined priming with default rules by presenting information on emission savings before ordering, which influenced preferences for a mushroom-beef burger over an all-beef burger.

In this study, the priming technique is employed through a video, by providing information and creating a fear appeal (Berger et al., 2022; Mirsch et al., 2017). Providing information to prime individuals about the consequences of specific behaviors is a common strategy used to influence cognitive resistance (Unsworth et al., 2012). Additionally, priming can be used to create fear appeals, by describing negative consequences if the action is not taken, which can thereby influence emotional resistance (Berger et al., 2022; Mirsch et al., 2017; Witte, 1992). Effective fear appeals can positively influence attitudes, intentions, and behaviors, particularly when they include efficacy statements as a tool to reduce resistance (Tannebaum et al., 2015; Witte, 1992; Kim et al., 2020).

Goal setting

In recent years, strategies focused on commitment, like goal setting, have been increasingly used to encourage sustainable behavior (Lokhorst et al., 2013). Goal setting acts as a pre-commitment strategy, where individuals are more likely to achieve their goals if they commit to them in advance (Sunstein, 2014; Berger et al., 2022). By proactively committing to certain objectives, consumers increase their motivation and align their behavior with their goals, thereby reducing behavioral resistance.

However, goal setting alone may not be effective in addressing emotional or cognitive resistance. Emotional resistance requires strategies that create emotional associations, such as creating a fear-hope structure (Nabi & Myrick, 2019; Nabi et al., 2018). Cognitive resistance, on the other hand, involves doubts about the innovation's effectiveness, which can be reduced by providing clear information (Bagozzi & Lee, 1999; Ram, 1987). Therefore, combining goal setting with priming (providing information) enhances its effectiveness in addressing all three resistance dimensions: emotional, cognitive, and behavioral.

Previous research supports the effectiveness of combining goal setting with other types of nudging in promoting change in the behavior of individuals (Loock et al., 2012, 2013; Abrahamse et al., 2005; Kroll et al., 2019). For instance, self-commitment nudges within web portals and smart home apps significantly reduced energy consumption when combined with goal setting (Loock et al., 2013; Kroll et al., 2019). They both found that goal setting alone was not significant, yet, in combination with another nudge, the results were significant. This highlights the importance of integrating goal setting with priming to maximize its effect on reducing resistance to sustainable innovation.

To examine the effects of the digital nudges, priming, and priming in combination with goal setting, on emotional, cognitive, and behavioral resistance, two hypotheses are formulated. The conceptual model of the expected relations can be found in Appendix 1. It is expected that priming alone will only influence cognitive resistance, by providing information, and emotional resistance by creating a fear appeal. To examine if there is also an effect on behavioral resistance, the digital nudge goal setting, in the form of commitment, is added. Therefore, the second hypothesis examines if there is an effect of the combination of priming and goal setting on all three dimensions. Consequently, the first two hypotheses are:

H_1: *Priming has a positive effect on reducing (a) emotional resistance, and (b) cognitive resistance to cultivated meat*

H_2: *Priming and goal setting together have a positive effect on reducing (a) emotional resistance, (b) cognitive resistance, and (c) behavioral resistance to cultivated meat.*

2.3 Pro-environmental attitudes

In recent years, psychology has increased their focus on understanding the various factors of sustainable behavior, with more attention to pro-environmental attitudes (Bissing-Olson et al., 2012). Pro-environmental attitudes is defined as the individual's commitment to protecting the environment by making more sustainable choices (Flores & Jansson, 2022). Over the last few years, there has been a growing interest in uncovering the motivation behind the pro-environmental behavior of consumers, with environmental concern as a crucial psychological determinant in decision-making, primarily in the context of sustainable innovations (Adnan et al., 2017; Flores and Jansson, 2022).

According to Stubbs et al. (2018), there is still a significant gap in awareness about the negative environmental impact of conventional meat production and consumption. The lack of awareness may keep the consumers from changing there resistance against meat alternatives, as they are not well aware of the significant problem of the meat industry. By addressing these environmental problems, individuals can make more informed decisions, and thereby potentially reducing the cognitive resistance. Pro-environmental behavior requires individual awareness and cognitive efforts to process the environmental consequences of their behavior (McDonald, 2014). A common strategy to influence individuals is providing information, also known as priming, about the consequences of specific behavior (Unsworth et al., 2012). Priming can help to stimulate and promote more pro-environmental behavior in both offline and online environments, so consumers can make more informed decisions

(Carroll & Young, 2005). In addition, Stieglitz et al. (2023) also suggest that digital nudges is an effective tool to significantly influence sustainable decision-making.

Previous research has examined pro-environmental attitudes, with individual preference for sustainable innovations, in different industries (Potoglou et al., 2020; Matthews & Rothenberg, 2017). For instance, in the automobile industry, pro-environmental individuals are more likely to choose eco-friendly options, whereas, in the apparel industry, pro-environmental beliefs are also increasing among fashion innovators. In addition, consumers incorporate environmental considerations into their purchasing decisions, by exhibiting a willingness to pay a premium for eco-friendly products (Sandra & Alessandro, 2021).

This study specifically examines the moderating role of pro-environmental attitudes on the effect between digital nudging and the dimensions of resistance. Thereby, this research seeks to determine a more comprehensive understanding of the influence of resistance to sustainable innovations. It is important to examine whether pro-environmental attitudes has an interaction effect, and if the interaction effect is stronger among consumers with a high PEA compared to those with lower PEA. By gaining more insight of this interaction effect it can help companies in targeting a more specific audience. Therefore, the following hypotheses are examined:

H_3: *The effect of priming on (a) emotional resistance, and (b) cognitive resistance is expected to be stronger among individuals with higher pro-environmental attitudes, compared to individuals with a lower pro-environmental attitudes.*

H_4: *The effect of priming in combination with goal setting on (a) emotional resistance, (b) cognitive resistance, and (c) behavioral resistance is expected to be stronger among individuals with higher pro-environmental attitudes, compared to individuals with a lower pro-environmental attitudes.*

3: Methodology

3.1 Research Method

Method of choice:

To examine the hypotheses set in this study, an online experiment is conducted, using priming and priming combined with goal setting as an intervention technique to reduce resistance to the sustainable innovation of cultivated meat. Online surveys have several advantages, including speed, a wide audience reach, and the capacity to pose sensitive questions.

The hypotheses are tested using a between-subject design, with digital nudging as the independent variable, emotional, cognitive, and behavioral resistance as the dependent variables, and pro-environmental (PEA) as the moderator. Digital nudging consists of categorical variables and is operationalized at three levels: baseline (no digital nudge), priming, and priming combined with goal setting. The three dimensions of resistance consist of metric variables. Lastly, the moderator, pro-environmental attitudes, also exist out of metric variables. This design allows to examine the main effect of digital nudging on the three dimensions of resistance, and interaction effect of pro-environmental attitudes.

Sampling

For this research, a survey is conducted targeting the Dutch population, aged 18 years and above. The survey has been distributed through various online (social media) channels, to ensure a broad reach. This study employs a non-probability sampling, meaning all respondents have an equal probability of being included (Sedgwick, 2013; Vehovar et al., 2016). To be more specific, convenience sampling is utilized, which implies that respondents were chosen based on their ease of recruitment (Sedgwick, 2013; Vehovar et al., 2016).

To ensure both statistical power and generalizability, this study targeted a sample size of 300 respondents, with 100 respondents per condition. Due to the use of three conditions, the uncertainty of effect sizes, and the use of a moderator, a larger sample size is necessary to effectively compare the groups. Cohen (2013) states that a larger sample size improves the ability to detect effects and to ensure a higher statistical power, in particular for detecting possible interaction effects.

3.2 Stimulus

In this research, two stimuli are utilized, which include the digital nudges and the description of the innovation of cultivated meat.

Digital nudging

The primary objective is to assess whether the two types of digital nudging, have an effect on reducing resistance compared to the baseline condition, where no nudge is presented. The two additional conditions are as follows: Condition 1 is priming, and Condition 2 is the combination of priming and goal setting.

Condition 1: Priming

The participants in condition 1 are exposed to a video from nu.nl (2023). This video aims to inform the respondents about the environmental consequences of meat consumption and production, particularly in terms of CO2 emissions. Moreover, it concluded with a message advocating for reducing meat consumption, thereby the video aims to create a fear appeal. The fear appeal is created by showing the negative environmental effects of conventional meat production and animals, therefore provoking that change is necessary if we want to preserve our way of life. The video is significantly shortened to retain only the relevant content for the prime and to match the context of this study. Irrelevant sections, such as animal slaughtering, were removed to focus solely on the environmental impact, to enhance the priming effect, and maintaining the participants' engagement with the research objectives.

Condition 2: Priming in combination with goal setting

In condition 2, the same video is shown as in the first condition. In addition, respondents are asked if they feel committed to helping the environment, by acknowledging the following statement: “To reduce environmental impact, meat consumption will have to be reduced. You can contribute to sustainability by choosing meat substitutes. Please indicate if you're willing to commit to this goal.” This statement draws on the findings of Banerjee et al.'s (2023) research. However, alterations are made to this statement to better align with the context of this study, focusing specifically on meat substitutes. This statement will determine whether respondents feel the inclination to contribute and make a positive contribution to sustainability.

The innovation of cultivated meat

Cultivated meat is an innovative biotechnological approach, which emerged as a more sustainable alternative to traditional meat production (Quevedo-Silva & Pereira, 2022). This involves the use of biotechnology, where satellite cells are extracted from animals or plants, and then multiplied into cultivated meat (Bhat et al., 2015; Quevedo-Silva & Pereira, 2022). Over the last few years, there has been an increase in engagement and recognition of cultivated meat as a sustainable alternative in food production (Chodkowska et al., 2022). The

innovation of cultivated meat is therefore a solution for the problems shown in the priming video. In the online survey, a picture of a cultivated meat burger is presented, accompanied by a description of cultivated meat, as shown in Appendix 2.

3.3 Key concepts and measurement

Resistance

Given the absence of an optimal scale to measure the effect on all three dimensions, a combined scale is made. In this study, a multidimensional 5-point Likert scale is utilized, covering the three dimensions of emotional, behavioral, and cognitive resistance. This scale is adapted from a framework in psychological research (Knowles & Riner, 2007) and includes selected items derived from the literature (Ngafeeson & Manga, 2021; Heidenreich & Spieth, 2013; Lee & Neale, 2012) as well as items developed by Master's theses students at Radboud University (Lammers, 2023; Bos, 2022). These items are used due to their reliability in accurately measuring the constructs of the three dimensions of resistance. The original items have been adapted to align with the context of this study, namely cultivated meat. The operationalization of the items the resistance dimensions can be found in Appendix 3.

For measuring emotional resistance, Bos (2022), used three items to capture the dimension of emotional resistance. These items showed strong reliability, with a Cronbach's alpha of 0.864. Consequently, it was decided to use those items in the emotional scale of this study. Similarly, to measure the behavioral scale, Bos (2022) utilized three items, adapted from various sources, which were found to be reliable as well, with a Cronbach's alpha of 0.874 (Ngafeeson & Manga, 2021; Heidenreich & Spieth, 2013; Lee & Neale, 2012). Given the reliability of this scale, no adaptations were made to the behavioral scale used in this study.

For cognitive resistance, no reliable scale was identified in previous theses. Consequently, a combination of items were derived from the literature of Ngafeeson and Manga (2021) and the thesis of Lammers (2023). Items CR1 and CR2, were found to be reliable by Lammers (2023), in which CR1 overlapped with the literature (Ngafeeson & Manga, 2021). Additionally, item CR3 has been adapted from Ngafeeson and Manga (2021), however is changed from "I analyze different aspects" to "I recognize different negative aspects". In Table 1, the constructs and measurement items of the resistance scale are shown:

Construct	Measurement items
Emotional resistance (Ngafeeson & Manga, 2021; Lammers, 2023; Bos, 2022)	**ER1**: I am irritated by cultivated meat **ER2**: Cultivated meat stresses me out **ER3**: I am frustrated by cultivated meat
Behavioral resistance (Ngafeeson & Manga, 2021; Heidenreich & Spieth, 2013; Lee & Neale, 2012; Lammers, 2023; Bos, 2022)	**BR1**: I would not switch to cultivated meat **BR2**: I would try as much as possible to avoid cultivated meat **BR3**: I would purchase cultivated meat
Cognitive resistance (Ngafeeson & Manga, 2021; Lammers, 2023; Bos, 2022)	**CR1**: I am critical about cultivated meat **CR2**: I see several disadvantages regarding cultivated meat **CR3**: I recognize different negative aspects of cultivated meat

Table 1: Measurement items of resistance

Pro-environmental attitudes

The New Ecological Paradigm (NEP) scale by Dunlap and Van Liere's (1978), is a commonly used measure of pro-environmental attitudes. However, despite its widespread use, critics have identified several shortcomings in the (NEP) Scale. The scale exhibited a lack of internal consistency among individual responses, poor correlation between the scale and behavior, and dated language used in the instrument's statements (Anderson, 2012, p. 260). Therefore, a revised NEP scale is introduced, to overcome these shortcomings (Dunlap et al., 2000). The revised scale includes a broader spectrum of dimensions of an ecological worldview and integrates a mix of both pro- and anti-NEP items (Dunlap et al., 2000). This revised scale demonstrated a higher internal consistency ($\alpha = .83$) compared to the original NEP scale ($\alpha = .81$) (Dunlap et al., 2000). The new scale includes fifteen items and has become the predominant method for measuring pro-environmental attitudes (Dunlap et al., 2000; Harraway et al., 2012; Anderson, 2012). However, following the pre-test, the number of items was reduced to 10 items, to maintain the clarity for the respondents. In this research, the adapted revised NEP scale is utilized to measure the moderating behavior of the pro-environmental attitudes. The 5-point Likert scale is a commonly used metric in the context of the NEP scale. This scale serves as a valuable tool for assessing the number of individuals' pro-environmental attitudes in the context of this research. The operationalization of the construct of pro-environmental attitudes can be found in Appendix 4.

Construct	Measurement items
Pro-environmental attitudes (Dunlap et al., 2000; Harraway et al., 2012; Anderson, 2012)	**PEA1**: We are approaching the limit of the number of people the earth can support **PEA2**: Human ingenuity will insure that we do NOT make the earth unlivable **PEA3**: Humans are severely abusing the environment **PEA4**: Plants and animals have as much right as humans to exist **PEA5**: The balance of nature is strong enough to cope with the impacts of modern industrial nations **PEA6**: The so-called "ecological crisis" facing humankind has been greatly exaggerated **PEA7**: The earth is like a spaceship with very limited room and resources **PEA8**: Humans were meant to rule over the rest of nature **PEA9**: The balance of nature is very delicate and easily upset **PEA10**: If things continue on their present course, we will soon experience a major ecological catastrophe

Table 2: Measurement items pro-environmental attitudes

Manipulation check

A manipulation check is conducted to control whether the interventions of the digital nudges were successful. The items of the manipulation check, as provided in Table 3 below, indirectly assess the manipulation's effectiveness, to ensure an accurate assessment. MC1 controlled whether respondents feel adequately informed, while MC2 controlled if any fear was evoked, thereby assessing the success of the prime. Respondents in the baseline condition are unlikely to agree with these questions as they were not exposed to the prime. In addition, MC3 controls whether respondents feel committed if they have seen the statement. Respondents in both the baseline condition as in condition 1 (priming), will most likely not feel committed as they have not seen the statement. Furthermore, the operationalization of the manipulation check items can be found in Appendix 5.

Construct	Measurement items
Priming (manipulation check)	**MC1**: I feel adequately informed about the harmfulness of meat consumption on the environment based on the information shown in this survey. **MC2**: I feel fear about climate change in response to the information presented in this survey.
Goal setting (manipulation check)	**MC3**: I feel committed to the goal of contributing to the reduction of conventional meat consumption.

Table 3: Measurement items manipulation check

3.4 Procedure

Pre-test

A pre-test was conducted among 14 respondents, to ensure the smooth progress of the survey and to provide more reliable and valid results in the actual survey. The pre-test aims to eliminate possible mistakes, misinterpretations, or other errors (Reynolds et al., 1993). In the pre-test it is examined whether the innovation is properly described, if the video works, if the statement is clear, and if all items were described clearly. In addition, it is controlled whether the manipulation of the digital nudges was successful.

After the pre-test a few adjustments were made to the survey. According to the respondents, five items from the NEP scale were unclear or difficult to read, and where therefore removed. The results also showed that the manipulation of the digital nudges was successful. Furthermore, answering the questions was made mandatory, ensuring that no questions could be skipped.

Online experiment

The survey has been distributed through social media, using the Qualtrics platform, where all information was collected anonymously. If participants do not consent to the use of their information, they were automatically directed to the end of the survey. Participants were randomly assigned to one of the following conditions, the baseline condition, condition 1: priming, or condition 2: priming + goal setting.

This survey was made in collaboration with two other Master's students, Yvonne Bruil and Anne-Sophie Nelissen, therefore, a total of three different innovations were randomly shown. For each innovation, 9 items of resistance were questioned. Subsequently, questions regarding the moderator, and pro-environmental attitudes. After answering all these questions,

three manipulation check questions were asked. Finally, there were a few demographic questions, about their gender, age, and educational level. In the end, all the respondents were thanked for their time, information, and cooperation.

3.5 Data analysis

Initially, all the data was examined for any missing data and checked which items needed to be reversed. Items BR3, PEA2, PEA5, PEA6, and PEA8 needed to be recoded. Next, a manipulation check was conducted to examine if the manipulation with priming and priming combined with goal setting were successful, and if therefore the data was reliable to use. This was done by conducting a MANOVA.

Next, a reliability analysis and a factor analysis were conducted for both the resistance scale and the NEP scale. First, a reliability analysis of the items of the resistance scale was done to check the reliability of the items used in the factory analysis. After this, a factor analysis was conducted, with principal axis factoring. Principal axis factoring was the most applicable since the primary goal is to identify any latent dimensions (Hair et al., 2019). This was repeated for the NEP scale as well.

To examine if there was an effect of priming and priming combined with goal setting on the three dimensions of resistance a MANOVA analysis was conducted. MANOVA is a multivariate procedure, since it is used to assess group differences across multiple metric dependent variables (Hair et al., 2019). To examine the effects a Post Hoc analysis is done, using Tukey's method.

Finally, a PROCESS-Macro analysis was conducted to examine whether there was an interaction effect of the moderator pro-environmental attitudes.

3.6 Research ethics

Over the last few years, there has been significant controversy about the utilization of digital nudging, mainly caused by concerns regarding autonomy and manipulation (Schmidt & Engelen, 2020). However, despite these concerns, digital nudging has demonstrated ethical attributes, for instance, participants have the freedom to choose whether or not to engage. Nonetheless, controversy still exists due to the unconscious nature of nudging (Rebonato, 2012). Furthermore, (digital) nudging is mostly employed for positive interventions aimed at positive interventions, leading to the conclusion that the concept of digital nudging is ethically justifiable.

Firstly, the participants of the survey needed to give consent to use their information solely for research purposes. Secondly, the participants were informed about the confidentiality and anonymity of their responses. Thirdly, in the introduction important information about the study was provided, and during the study there was always a possibility to quit. Fourthly, if the participants had any questions there was an email address of one of the researchers to ask them. Lastly, throughout the entire study, the ethical guidelines, set by the Radboud University in Nijmegen, were followed.

4: Results

4.1 Examination of the Sample

Data cleaning

Prior to the analyses, the data was cleaned to remove all invalid cases. The survey was distributed to participants aged 18 and above. However, due to the encouragement for further sharing, one respondent, aged 15, participated and was therefore deleted. Additionally, 53 respondents who completed less than 50% of the survey, along with 4 respondents who did not provide consent to participate, were removed from the dataset. From the 53 deleted respondents were, 12 from the baseline condition, 18 from condition 1, and 23 from condition 2. Furthermore, 4 respondents from Condition 1 and 4 from Condition 2 were excluded as they did not finish watching the required video. Moreover, 15 respondents in Condition 2 did not demonstrate the required commitment and were therefore removed. The manipulation check confirmed that priming and goal setting were not a successful intervention for these respondents, justifying their exclusion. In total, 81 respondents were excluded, leaving 318 respondents. Due to the mandatory response options, there was no missing data.

Despite the random allocation of respondents, the new distribution is as follows: 121 respondents in the baseline condition, 110 in Condition 1, and 87 in Condition 2. The lower exclusion rates in the baseline condition can be attributed to the absence of a video to watch and no requirement to agree to the goal setting statement, as is needed in condition 1 and 2.

Descriptives

The final sample consisted of N=318 respondents, as shown in Appendix 7. Among these respondents was, 45.3% male, 54.4% female, and 0.3% identified as other, with an average age of 35 years old (SD=16.067). The educational levels were as follows: 0.3% finished elementary school, 11% high school, 17.3% MBO, 28% HBO Bachelor, 3.1% HBO Master, 17% WO Bachelor, 21.7% WO Master and lastly 1.6% completed a PhD.

4.2 Scale reliability and validity

Before controlling the scale reliability and validity, the following items (BR3, PEA2, PEA5, PEA6, and PEA8) needed to be reversed due to their negative wording, to ensure the consistency in the analysis (Field, 2018)

4.2.1 Manipulation check

Assumptions

A MANOVA was conducted to assess the effectiveness of the digital nudge manipulations

(Appendix 8). Prior to the MANOVA analysis, the assumptions were assessed. The homogeneity of covariance assumption was examined using Box's M test, yielding a non-significant result *(F*(12)= 76.141, p = <.001). Despite this, the assumption was conditionally accepted due to the approximately equal group sizes (ratio of the largest group to smallest group <1.5) (Field, 2018), justifying the use of Pillai's Trace. Pillai's Trace showed a significant effect of condition 1 and 2 on the manipulation check variables, (λ(Pillai) = 0.416, F(6, 628) = 27.499, p < 0.001), which is supported by a large effect size (ηp^2 = .208) (Cohen, 1988). Finally, the assumptions of linearity, normality (skewness and kurtosis ranged between -3 and +3), and multicollinearity (not exceeding r=.9) (Tabachnick & Fidell, 2012) were met, ensuring the validity of this analysis.

MANOVA Analysis

The results of a between-subjects effects test showed significant effects of digital nudging on the manipulation check items: MC1 *(F* (2,315) = 61.676, p < .001), MC2 *(F* (2,315) = 61.729, p < .001), and MC3 *(F* (2,315) = 19.649, p < .001), indicating large effect sizes for MC1 (ηp^2 = .281) and MC2 (ηp^2 = .282), and a medium to large effect for MC3 (ηp^2 = .111) (Cohen, 1988).

Post hoc analysis

Items MC1 and MC2 showed a significantly higher effect of condition 1 (priming) compared to the baseline condition (Mean Difference = 1.56, p < .001; Mean Difference = 1.33, p < .001). However, there was no significant effect between condition 1 (priming) and 2 (priming combined with goal setting) for MC1 (Mean Difference = .00, p = 1.000) and MC2 (Mean Difference = -.33, p = .118), meaning the observed difference is more likely to be random rather than a true underlying effect. This demonstrates a successful manipulation of priming, as participants in condition 1 (priming) scored significantly higher on MC1 and MC2.

In addition, MC3 showed a significantly higher effect for condition 2 compared to both condition 1 (Mean difference = 1.06, p <.001) and the baseline condition (Mean difference = 1.08, p <.001). There was no significant difference between condition 1 and the baseline condition for MC3 (Mean Difference = .02, p = .994). This indicates that the manipulation of goal setting was also successful, as participants in condition 2 scored significantly higher on MC3.

4.2.2 Factor analysis resistance scale

To ensure the validity and reliability of this scale, a confirmatory analysis was conducted to verify if the items loaded correspondingly on the right construct. A principal axis factoring with direct oblimin rotation was used (Appendix 9). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .900, exceeding the criterium of .50 (Field, 2018). In addition, Barlett's Test of Sphericity was significant (χ^2 (36) = 3118.902, $p < .001$), indicating correlations between the variables, and justifying the sample adequacy (Field, 2018). Moreover, all items had communalities exceeding .20 after extraction. A fixed factor of three[1] was used due to the confirmatory analysis of cognitive, behavioral, and emotional resistance dimensions. In the correlation matrix, at least one correlation exceeded 0.30 (Field, 2018), justifying an oblique rotation. The pattern matrix confirmed the absence of double-loaders, so no items needed to be deleted from the resistance scale.

4.2.3 Reliability test resistance scale

The scales of emotional resistance (Cronbach's Alpha = .948), cognitive resistance (Cronbach's Alpha = .928), and behavioral resistance (Cronbach's Alpha = .940) all demonstrated a high reliability (exceeding the threshold of .7, Hair et al., 2019), with no substantial increase if any item was deleted.

4.2.4 Factor analysis NEP scale

A confirmatory factor analysis using principal axis factoring was conducted for the NEP scale (Appendix 9). The KMO measure was .869, and Bartlett's Test of Sphericity was significant ($\chi^2(36) = 1024.774$, $p < .001$), justifying the sample adequacy (Field, 2018). Moreover, all items showed communalities exceeding the criterium of .20 after extraction. In this analysis one fixed factor is used[2], referring to pro-environmental attitudes. However, item PEA2 had a communality after extraction of <.20, and is therefore deleted from the analysis. Lastly, the pattern matrix confirmed the absence of any double-loaders.

4.2.5 Reliability test NEP scale

The NEP scale demonstrated a Cronbach's Alpha of .836. After deleting item PEA2, the

[1] Based on the criteria of eigenvalues >1, identifying the break in the scree plot, and a cumulative of total variance >60%, the items only loaded on two factors instead of the desired three. However, the decision was made to proceed with a fixed factor of three to align with the theoretical expectations of this study.

[2] Based on the criteria of eigenvalues >1, identifying the break in the scree plot, and a cumulative of total variance >60%, the items initially loaded on two factors, instead of the desired 1. However, to align with the practical aims of this study, a fixed factor of one, representing PEA was chosen . Additionally, with 2 factors, item PEA9 would be a double loader, however its deletion would decrease the Cronbach's alpha of the NEP. Justifying the use of 1 fixed factor.

Cronbach's Alpha increased to .851, confirming the scale's reliability as the threshold of .7 is exceeded (Hair et al., 2019) (Appendix 10).

4.3 MANOVA analysis: (Hypotheses 1 &2)

A MANOVA was conducted to analyze the effect of digital nudging on the three dimensions of resistance (Appendix 11). Prior to the analysis, a new mean variable for resistance was computed from the items of representing each dimension. The baseline condition, condition 1 (priming) and condition 2 (priming + goal setting) were the independent variables. All assumptions were checked beforehand.

Assumptions

Box's M test for homogeneity of covariance showed a non-significant *(F*(12) = 78.246, $p <$ .001), but the assumption was conditionally accepted due to approximately equal group sizes (largest to smallest group ratio <1.5). Consequently, Pillai's Trace was used, which showed a significant effect of Condition 1 and Condition 2 on resistance ($\lambda = 0.166$, $F(6, 628) = 9.480$, $p < .001$, $\eta p^2 = .083$), and indicated a medium effect size (Cohen, 1988). Moreover, the assumptions of linearity, normality (skewness/kurtosis between -3 and +3), and multicollinearity (not exceeding r = .9, Tabachnick & Fidell, 2012) were met, ensuring the validity of this analysis.

MANOVA analysis

The between-subjects effects test showed a significant effect of nudging reducing all three dimensions of resistance: emotional resistance *(F* (2,315) = 10.233, $p < .001$, ηp2 = .061), behavioral resistance *(F* (2,315) = 11.155, $p < .001$, ηp2 = .066), and cognitive resistance *(F* (2,315) = 7.258, $p < .001$, ηp2 = .044). Furthermore, emotional and behavioral resistance showed medium effect sizes, while cognitive resistance had a small to medium effect size (Cohen, 1988), which highlights the varying impact across the three dimensions of resistance.

Post hoc analysis

Hypothesis 1:

The participants in condition 1 showed significantly less emotional resistance than the participants in the baseline condition (Mean difference = -.66, $p <.001$), meaning hypothesis 1a can be accepted. In addition, the participants in condition 1 also showed significantly less cognitive resistance than the participants in the baseline condition (Mean difference = -.45, $p = .013$), meaning hypothesis 1b can also be accepted.

Hypothesis 2:

The participants in condition 2 showed significantly less emotional resistance compared to the participants in the baseline condition (Mean difference = -.62, p <.001), meaning hypothesis 2a can be accepted. Moreover, the participants in showed also less cognitive resistance in condition 2, compared to the baseline condition (Mean difference = -.60, p <.001), resulting in acceptance of hypothesis 2b. Additionally, participants in condition 2 showed significantly less behavioral resistance (BR) compared to both the baseline condition (Mean difference = -.80, p <.001) and condition 1 (Mean difference = .66, p <.001). This means that hypothesis 2c, can also be accepted.

4.4 Moderator analysis – PROCESS MACRO (Hypotheses 3 & 4)

A moderator analysis, using PROCESS MACRO, was conducted to examine the interaction effect of pro-environmental attitudes (PEA) on the effect between the digital nudges and resistance (Appendix 12). Prior to the analysis a new mean variable of the NEP scale was created. The conditional effect was assessed based on -1SD (Low PEA), the mean (average PEA), and +1SD (High PEA), as PEA is a continue variable.

Hypothesis 3:

The interaction effect of PEA on the relationship between condition 1 and emotional resistance (ER) was significant (p <.001), indicating that PEA moderates the relationship (β= .659, SE= .253, t (314) = 2.606, p =.010). This means, hypothesis 3a needs to be rejected, because although there is an interaction effect, the moderation effect decreases as PEA becomes stronger. Between condition 1 and cognitive resistance (CR) there was no interaction effect found of PEA, (β= .410, SE= .229, t (314) = 1.792, p = .074). Therefore, hypothesis 3b is rejected as well.

Hypothesis 4:

The interaction effect of PEA on the relationship between condition 2 and emotional resistance (ER) showed a significant effect (p <.05), indicating that PEA moderates the relationship (β= .450, SE= .192, t (314) = 2.348, p = .019). Meaning, hypothesis 4a needs to be rejected, because there is only an interaction effect when the PEA is low. When the PEA becomes stronger, the moderation effect decreases, which is in contrast to the hypothesis.

Between condition 2 and cognitive resistance (CR) (β= .270, SE= .225, t (314) = 1.203, p = .230) and behavioral resistance (BR) (β= .256, SE= .213, t (314) = 1.199, p = .232) there was no significant interaction effect of PEA, therefore hypothesis 4b and 4c are rejected.

5: Conclusion & Discussion

5.1 Summary

This study examines the effect of digital nudging, through priming and the combination of priming with goal setting, on reducing resistance to the sustainable innovation of cultivated meat, moderated by pro-environmental attitudes. This research builds upon the research of Stryja et al. (2017) and Stryja and Satzger (2019), to help extend the literature about resistance to sustainable innovations as requested by Huang et al. (2021). In previous research the multifaced concept of resistance is often overlooked. Therefore, this study made a distinction between three dimensions: emotional, cognitive and behavioral resistance. Emotional resistance is primarily influenced by feelings and fear, while cognitive resistance is driven by lack of information about the innovation. In addition, behavioral resistance is mostly influenced by setting goals so consumers feel more committed and motivated. Therefore, this study used the fear-hope and problem-solution dynamic to influence each resistance dimension (Nabi & Myrick, 2019; Nabi et al., 2018).

Nudging is a promising strategy to help reduce consumer resistance (Mani & Chouk, 2017). More specifically, (green) digital nudging, which aims to subconsciously influence consumers in the digital environment towards more sustainable choices (Weinmann et al., 2016; Akbulut-Yuksel and Boulatoff, 2021). Digital nudging can take various forms, for example through framing, priming, goal setting, default setting. In this study, priming and priming in combination with goal setting are utilized, as they are both applied before the actual decision-making occurs (Zimmerman et al., 2021). In this study, consumers are primed through a video, by proving information about the negative impacts of conventional meat, and by creating a fear appeal. This will influence both the cognitive resistance as the emotional resistance. In addition, goal setting is used to influence behavioral resistance, in which consumers have to give commitment to a sustainable goal.

Additionally, this study examines whether pro-environmental attitudes (PEA) has a moderating role, in the effect between digital nudging and resistance to a sustainable innovation. Moreover, it is examined if the moderating effect is stronger for consumers with a higher PEA compared to those with low PEA. Therefore, the following research question is conducted:

"What is the effect of digital nudging, in the form of priming and the combination of priming and goal setting, on reducing resistance to the sustainable innovation of cultivated meat, moderated by pro-environmental attitudes?"

The results of the study support the expected effects of digital nudging in reducing resistance. More specifically, participants in the priming condition (Condition 1) showed lower emotional and cognitive resistance compared to the baseline group. Similarly, the participants in the condition of priming combined with goal setting (Condition 2) showed less emotional, cognitive, and behavioral resistance compared to the baseline group. Therefore, both hypotheses 1 and 2 can be accepted.

Additionally, this study solely found an interaction effect of PEA on the effect between priming (Condition 1) and the combination of priming with goal setting (Condition 2) on emotional resistance. However, although there was a significant interaction effect, the results were contrary to the hypotheses. It was expected that higher PEA would enhance the effectiveness of digital nudging. Instead, the moderating effect on emotional resistance diminished as PEA increased, therefore hypotheses 3a and 4a are rejected. Furthermore, no significant interaction effects were found for condition 1 on cognitive resistance, and for condition 2 on both cognitive and behavioral resistance, meaning hypotheses 3b and 4bc are also rejected.

5.2 Theoretical implications

This study contributes to the literature by building upon the literature of Stryja et al. (2017) and Stryja and Satzger (2019) on digital nudging as an intervention method to reduce resistance on sustainable innovations. Both studies found that digital nudging was an effective intervention tool, however priming was shown as not significant. Contrary to these findings, this study did identify a significant positive effect of priming on reducing resistance. It can be assumed that this difference is due to the difference in the priming method. While Stryja et al. (2017) and Stryja and Satzger (2019), used word puzzles and slogans, this study employed a video, which in this context proved to be an effective priming tool. However, the study of Stryja et al. (2017) was conducted among a small sample size (n=20), which may account for the non-significant findings; Nonetheless, this study, with a larger sample size (n=318), did show significant effects, suggesting that priming can be an effective tool to reduce resistance.

In addition, this study explored the combined effect of priming, through a video, and goal setting, where they had to commit to a sustainable goal. The addition of goal setting was used to also affect the behavioral resistance. However, the combination of just goal setting and priming had not been used in prior research (Berger et al., 2022). This study showed that

with the combination of priming and goal setting all three dimensions of resistance had a significant reducing effect.

Moreover, this study aimed to develop a reliable scale to measure the multifaceted nature of resistance, as most research focused on resistance as a one-dimensional construct (Ram & Sheth, 1989; Kleijnen et al., 2009). By including various items from psychological research, a reliable scale, with all items exceeding a Cronbach's Alpha of .7, was created to measure each dimension of resistance: emotional, cognitive and behavioral resistance (Castro et al., 2019; Ngafeeson & Manga, 2021). Furthermore, while the integration of the combination of emotional, cognitive, and behavioral resistance is commonly employed in psychological and behavioral research, it had not been empirically validated in the context of resistance to innovation (Grubber et al., 2019; Knowles & Riner, 2007). This study addressed this gap by creating and empirically testing a scale that covers all three dimensions in the context of resistance to innovation.

In the factor analysis of the resistance scale, the items initially loaded on two constructs. It can be assumed that this happened due to the similarity and interconnection between emotional and cognitive resistance, as is consistent with research from Castro et al. (2019) and Valor et al. (2022), suggesting that emotion and cognition are interconnected. However, this study examined the effect of the three separate dimensions and therefore a fixed factor of three was used. Similarly, the items of the NEP scale initially loaded on two constructs instead of the desired one. Nevertheless, as in this study pro-environmental attitudes is examined as a single construct, a fixed factor of one is used.

Lastly, pro-environmental attitudes (PEA) only showed a significant interaction effect between priming (condition 1) and priming in combination with goal setting (condition 2) on emotional resistance. However, despite the significant interaction effect on emotional resistance, the results were contrary to the hypotheses. It was expected that higher PEA would enhance the effectiveness of digital nudging. Instead, the moderating effect on emotional resistance diminished as PEA increased, meaning hypotheses 3a and 4a cannot be accepted. Moreover, there was no significant interaction effect between priming (condition 1) and priming combined with goal setting (condition 2) on cognitive resistance, and there was no interaction effect between priming combined with goal setting (condition 2) on behavioral resistance, which means that hypotheses 3b and 4bc cannot be accepted. The significant interaction effects of PEA on emotional resistance can be attributed to the strongly linked personal values and beliefs, such as pro-environmental attitudes, making emotional resistance

more easily influenced by the priming technique, which are typically aimed at influencing these feelings and attitudes (Berger et al., 2022; Mirsch et al., 2017).

The decrease in the strength of the interaction effect with high PEA, may indicate a ceiling effect. Meaning, individuals with high pro-environmental attitudes are for instance less sensitive to external influences, as they are already highly motivated to adopt more sustainable behavior. Consequently, it can be assumed that consumers with a lower PEA, are more easily influenced to change their behavior, as there is more room for improvement. For instance, consumers with low PEA, may initially resist these sustainable innovations, however after the intervention they have more room to change their behavior and reduce their resistance.

5.3 Limitations and future research

Despite the promising results of this study, there are also several limitations which should be considered. At first, in this study only the effectiveness of priming and priming combined with goal setting is explored. This can potentially limit the generalizability of the results to digital nudging as a broader concept. Future research can extend the literature by exploring a wider range of (digital) nudging techniques, such as feedback, framing, and defaults (Berger et al., 2020), to provide a more comprehensive understanding on the effectiveness of digital nudging on resistance. Additionally, this study only examined the short-term effects, whereas future research should also consider to explore the long-term effectiveness of digital nudging.

Secondly, this study focused on the context of sustainability, by showing the negative effects of conventional meat and the environmental benefits of alternative innovations. The interventions of priming and priming combined with goal setting aimed to subconsciously influence participants. The theory behind the effectiveness of this nudge, is the 'problem-solution' and 'fear-hope' structure (Nabi & Myrick, 2019; Nabi et al., 2018). In this study, the problem was the negative environmental impacts of conventional meat, and the provided solution was the innovation cultivated meat. Despite the fact that this study did not examine digital nudging in a different (non)-sustainable context, it can be assumed that when similar psychological mechanisms are involved, that similar interventions could also influence the behavior in different contexts, such as health and finance.

Thirdly, it can be assumed that the demographics of this study may not be fully representative of the general population. This research was conducted among Dutch respondents, however future research should examine whether the findings differ among other

countries. Additionally, there was a large peak of participants aged 18-25, which most likely reflects the characteristics of the student population. Future should examine whether the results vary across different age groups, to get a more comprehensive understanding.

Fourth, in the factor analysis of the resistance scale, the items initially loaded on two factors instead of the intended three dimensions (cognitive, behavioral, and emotional resistance). This can be attributed to the similarity between emotional and cognitive resistance (Castro et al., 2019; Valor et al., 2022). However, this study examined the effect of digital nudging on all three dimensions of resistance, therefore a fixed factor of 3 is used. Similarly, in the factor analysis of the NEP scale, the items initially loaded on two factors. Nonetheless, this study considers pro-environmental attitudes as a single construct, therefore a fixed factor of one is used. By utilizing fixed factors, important dimensions or interrelationships between items that naturally emerge may be overlooked. Although the use of fixed factors was necessary in this research, it does show the need for further validation of the used scales. In the ideal situation, the use of fixed factors should not be necessary, as this may compromise the accuracy of the analyses.

Lastly, the assumption of homogeneity of covariance matrixes, which is necessary for the validity for the MANOVA results, was not met in this study. Since the Box's M test showed non-significant results, the Pillai's trace criterion was used instead of the Wilks' Lambda. The Pillai's trace criterion is a more robust test, which can be used when one or more assumptions are violated in a MANOVA analysis (Hair et al., 2019). However, Wilks' Lambda is generally more preferred since it is more sensitive to detect differences between groups under ideal conditions.

5.4 Practical implications

The main insight from this study is that digital nudges, such as priming and goal setting, work effectively to reduce the resistance to sustainable innovations. It is important for managers to apply these findings, as minimizing resistance to sustainable innovations is crucial for companies and economic well-being (Dibrov, 2015; Ram & Sheth, 1989).

This study showed the significant effectiveness of a video as a priming technique to reduce consumer resistance. Companies can incorporate this priming technique into their digital landscapes or marketing strategies, by incorporating videos that raise awareness about the negative environmental effects of conventional meat, and to offer a solution for an alternative, more sustainable option, such as cultivated meat. It is essential for marketers to have an

understanding of consumer behavior and attitudes to create more personalized nudges for the specific target groups, as the effectiveness of the digital nudge in this study for example varied based on the level of pro-environmental attitudes (PEA) consumers have. The higher the level of PEA, the lower interaction effect was. This suggests, that individuals with higher PEA's might require a different approach to further reduce their resistance. Additionally, marketers can form partnerships with sustainable companies to advocate for more sustainable innovations, thereby enhancing the effect of digital nudges in reducing consumer resistance.

For a digital nudging strategy to be effective it is important to include a problem-solution and fear-hope dynamic (Nabi & Myrick, 2019; Nabi et al., 2018; Berger et al., 2022). In the context of this research, the problems of climate change and the negative impact of conventional meat should be highlighted, followed by the solution of for instance cultivated meat. In addition, creating a fear appeal can emotionally engage consumers, which can potentially influence behavioral change, and therefore reduce resistance. Notably, this research found that priming only reduces emotional and cognitive resistance. To also influence behavioral resistance, the digital nudge, goal setting should be integrated. In addition, marketers can use goal setting as an interactive tool to communicate and to create more efficacy. To foster this efficacy, marketers can create personas, helping consumers feel more connected and motivated to commit to the goal setting. However, it is important to consider that a certain number of individuals may not commit to the goal. In this study, for those who did not give commitment, the digital nudge was also found to be ineffective.

In summary, the integration of priming and goal setting, provides an effective approach to reduce resistance to sustainable innovations. By adapting these techniques into the digital environment and marketing strategies, companies can achieve less resistance and promote long-term sustainable behavior.

5.5 Concluding statement

This study highlights the significant effect of digital nudging on resistance. Specifically, the significant effect of priming on emotional and cognitive resistance, and the effect of priming combined with goal setting on emotional, cognitive and behavioral resistance. By distinguishing between emotional, cognitive and behavioral resistance, this research can provide a comprehensive understanding of the multifaceted nature of resistance. However, the expected moderating effect of pro-environmental attitudes was not observed, indicating the need for further research.

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Appendices

Appendix 1: The conceptual model

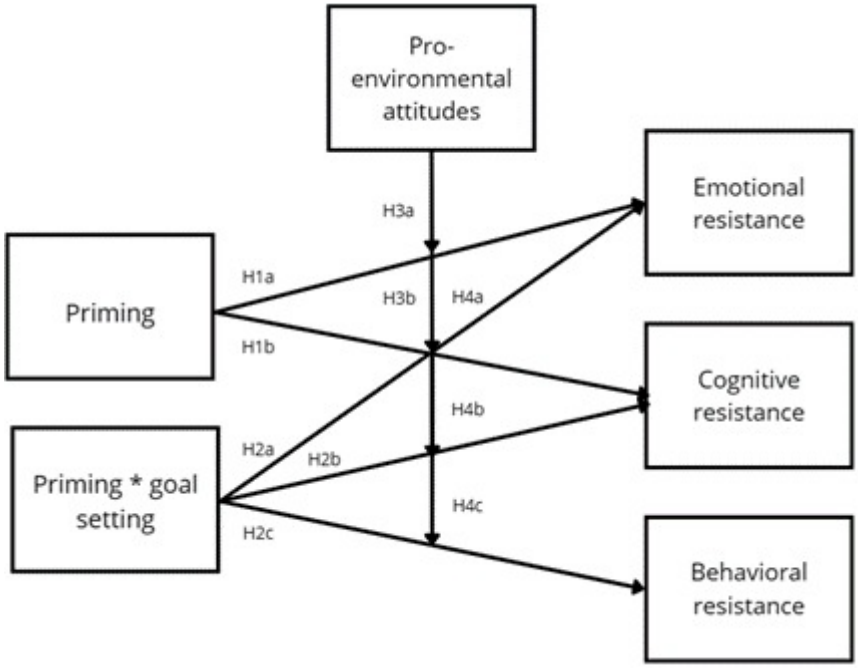

Figure 1: Conceptual model

Appendix 2: Stimulus cultivated meat burger

Figure 2: (Nutzelhem, 2021)

Hier ziet u een kweekvleesburger. De burger wordt ontwikkeld door middel van celkweektechnologie in het lab, op basis van dierlijke of plantaardige cellen. De kweekvleesburger is een duurzame vleesvervanger.

Appendix 3: Operationalization of the dimensions of resistance

Construct	Definition	Original items	Adapted items	Translated items (to Dutch)
Emotional resistance (Ngafeeson & Manga, 2021)	The (negative) emotions that an individual can exhibit toward a proposed change	**ER1:** I was irritated by the way the new EHR system restricts my pattern of work	**ER1**: I am irritated by cultivated meat	**ER1**: De kweekvlees burger roept irritatie bij me op
		ER2: I was stressed by the change brought by the new EHR system	**ER2**: Cultivated meat stresses me out	**ER2**: De kweekvlees burger roept stress bij me op
		ER3: I felt frustrated about how the new EHR system works	**ER3**: I am frustrated by cultivated meat	**ER3**: De kweekvlees burger roept frustratie bij me op
Behavioral resistance (Ngafeeson & Manga, 2021; Heidenreich & Spieth, 2013; Lee and Neale, 2012)	The reaction of an individual by not changing, or behaving in a certain way toward the innovation	**BR1**: I cannot be bothered to think about switching to another service provider	**BR1**: I would not switch to cultivated meat	**BR1**: Ik zou niet overstappen op de kweekvlees burger
		BR2: I tried as much as possible to avoid some aspects of the new HER system	**BR2**: I would try as much as possible to avoid cultivated meat	**BR2**: Ik zou de kweekvlees burger zoveel mogelijk proberen te vermijden

		BR3: How likely do you feel it is that you would purchase this product?	**BR3**: I would purchase cultivated meat	**BR3**: Ik zou de kweekvlees burger kopen
Cognitive resistance (Ngafeeson & Manga, 2021)	Skepticism toward a proposed change due to the individual's knowledge	**CR1**: I was critical about the new EHR system	**CR1**: I am critical about cultivated meat	**CR1**: Ik ben kritisch over de kweekvlees burger
		CR2: I saw several weaknesses with the new EHR system	**CR2**: I see several disadvantages regarding cultivated meat	**CR2**: Ik zie verschillende nadelen aan de kweekvlees burger
		CR3: I analyzed different aspects of the new EHR system.	**CR3**: I recognize different negative aspects of cultivated meat	**CR3**: Ik herken verschillende negatieve aspecten van de kweekvlees burger

Appendix 4: Operationalization of the moderator pro-environmental attitudes

Construct	Original items	Adapted/Used items	Translated items (to Dutch)
Pro-environmental attitudes (Dunlap et al., 2000; Harraway et al., 2012; Anderson, 2012)	**PEA1**: We are approaching the limit of the number of people the earth can support	**PEA1**: We are approaching the limit of the number of people the earth can support	We zijn de limiet aan het bereiken van het aantal mensen dat de aarde kan dragen
	PEA2: Humans have the right to modify the natural environment to suit their needs	X	Mensen hebben het recht om in te spelen op de natuurlijke omgeving om hun eigen noden te kunnen nastreven
	PEA3: When humans interfere with nature it often produces disastrous consequences	X	Als mensen de natuur bewerken, brengt dit vaak rampzalige gevolgen met zich mee
	PEA4: Human ingenuity will insure that we do NOT make the earth unlivable	**PEA2**: Human ingenuity will insure that we do NOT make the earth unlivable	De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde NIET onleefbaar maken
	PEA5: Humans are severely abusing the environment	**PEA3**: Humans are severely abusing the environment	Mensen maken sterk misbruik van het milieu
	PEA6: The earth has plenty of natural resources if we just learn how to develop them	X	De aarde heeft genoeg natuurlijke bronnen als we maar leren hoe we ze moeten ontwikkelen
	PEA7: Plants and animals have as much right as humans to exist	**PEA4**: Plants and animals have as much right as humans to exist	Planten en dieren hebben evenveel bestaansrechten als de mens

	PEA8: The balance of nature is strong enough to cope with the impacts of modern industrial nations	**PEA5**: The balance of nature is strong enough to cope with the impacts of modern industry	Het evenwicht van de natuur is sterk genoeg om te kunnen omgaan met de impact van de moderne industrie
	PEA9: Despite our special abilities humans are still subject to the laws of nature	X	Ondanks onze gespecialiseerde capaciteiten, is de mens nog steeds ondergeschikt aan de wetten van de natuur
	PEA10: The so-called "ecological crisis" facing humankind has been greatly exaggerated	**PEA6**: The so-called "ecological crisis" facing humankind has been greatly exaggerated	De zogenaamde 'ecologische crisis' wordt sterk overdreven
	PEA11: The earth is like a spaceship with very limited room and resources	**PEA7**: The earth is like a spaceship with very limited room and resources	De aarde is zoals een ruimteschip met een heel beperkte ruimte en beperkte bronnen
	PEA12: Humans were meant to rule over the rest of nature	**PEA8**: Humans were meant to rule over the nature	Mensen zijn bestemd om te heersen over de natuur
	PEA13: The balance of nature is very delicate and easily upset	**PEA9**: The balance of nature is very delicate and easily upset	Het natuurlijke evenwicht is heel gevoelig en gemakkelijk verstoord
	PEA14: Humans will eventually learn enough about how nature works to be able to control it	X	Mensen zullen uiteindelijk genoeg leren over de werking van de natuur om in staat te zijn deze te beheersen

	PEA15: If things continue on their present course, we will soon experience a major ecological catastrophe	**PEA10**: If things continue on their present course, we will soon experience a major ecological catastrophe	Als de zaken zich voortzetten op de huidige manier, zullen we binnenkort te maken krijgen met een enorme ecologische catastrofe

Appendix 5: Operationalization of the manipulation check items

Construct	**Measurement items**	**Translated items** (to Dutch)
Priming (manipulation check)	**MC1**: I feel adequately informed about the harmfulness of meat consumption on the environment based on the information shown in this survey.	**MC1**: Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu.
	MC2: I feel fear about climate change in response to the information presented in this survey.	**MC2**: Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering.
Goal setting (manipulation check)	**MC3**: I feel committed to the goal of contributing to the reduction of conventional meat consumption.	**MC3**: Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie.

Appendix 6: Final questionnaire

Enquête definitief - kopiëren (FINAL)

Enquêteflow

Block: Introductie (2 Questions)

BlockRandomizer: 1 - Evenly Present Elements

- Standard: Baseline conditie (1 Question)
- Standard: Condition 1: Priming (2 Questions)
- Standard: Condition 2: Priming + goal setting (3 Questions)

Standard: Tussenkopje (1 Question)

BlockRandomizer: 3 - Evenly Present Elements

- Standard: Yvonne: Insecten burger (4 Questions)
- Standard: Nikki: Kweekvlees burger (4 Questions)
- Standard: Anne-sophie: Zeewier burger (4 Questions)

Standard: Manipulation check (1 Question)
Standard: Pro-environmental attitude (1 Question)
Standard: Algemeen (3 Questions)

Pagina-einde

Start van blok: Introductie

Q1 Beste respondent,

Voor onze master thesis aan de Radboud Universiteit doen wij, onder begeleiding van dr. S.M. Ritter, onderzoek naar de reactie van consumenten op duurzame innovaties. In deze enquête zullen wij een aantal vragen stellen over uw houding ten opzichte van een drietal duurzame innovaties.

Uw antwoorden blijven volledig anoniem en zullen uitsluitend gebruikt worden voor onderzoeksdoeleinden. Het invullen van de enquête zal ongeveer 5 minuten van uw tijd in beslag nemen.

Alvast hartelijk bedankt voor uw deelname!
Anne-Sophie Nelissen, Nikki Kramer & Yvonne Bruil

Voor vragen of opmerkingen kunt u een mail sturen naar: nikki.kramer@ru.nl

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Q18 Wilt u doorgaan met de enquête of wenst u te stoppen?

○ Ik stem vrijwillig in met mijn deelname aan dit onderzoek, waarbij mijn onderzoeksgegevens anoniem en veilig worden opgeslagen volgens de richtlijnen voor gegevensbeheer van de Radboud Universiteit. (1)

○ Ik geef GEEN toestemming voor deelname aan dit onderzoek en besluit om de enquête te stoppen. (2)

Ga naar: Einde enquête Als Wilt u doorgaan met de enquête of wenst u te stoppen? = Ik geef GEEN toestemming voor deelname aan dit onderzoek en besluit om de enquête te stoppen.

Einde blok: Introductie

Start van blok: Baseline conditie

Q16 De enquête start nu.

Einde blok: Baseline conditie

Start van blok: Condition 1: Priming

Q12 Bekijk nu onderstaande video. Vergeet hierbij niet uw geluid aan te zetten. De video duurt iets langer dan een minuut. Daarna kunt u de enquête voortzetten.

NU.nl. (2023, 23 februari). Zoveel minder vlees moeten we eten om het klimaat te redden [Video]. NU.nl. Geraadpleegd op 4 maart 2024, van https://www.nu.nl/298496/video/zoveel-minder-vlees-moeten-we-eten-om-het-klimaat-te-redden.html

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Q35 Heeft u de video volledig bekeken?

○ Ja (1)

○ Nee (2)

Einde blok: Condition 1: Priming

Start van blok: Condition 2: Priming + goal setting

Q13 Bekijk nu onderstaande video. Vergeet hierbij niet uw geluid aan te zetten. De video duurt iets langer dan een minuut. Daarna kunt u de enquête voortzetten.

NU.nl. (2023, 23 februari). Zoveel minder vlees moeten we eten om het klimaat te redden [Video]. NU.nl. Geraadpleegd op 4 maart 2024, van https://www.nu.nl/298496/video/zoveel-minder-vlees-moeten-we-eten-om-het-klimaat-te-redden.html

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Q36 Heeft u de video volledig bekeken?

- ○ Ja (1)
- ○ Nee (2)

Q14 Om de impact op het milieu te verkleinen, zal vleesconsumptie verminderd moeten worden. U kunt bijdragen aan duurzaamheid door in de toekomst (ook) te kiezen voor vleesvervangers.

- ○ Ja, ik wil bijdragen aan dit doel. (1)
- ○ Nee, ik wil NIET bijdragen aan dit doel. (2)

Einde blok: Condition 2: Priming + goal setting

Start van blok: Tussenkopje

Nu volgen vragen over drie verschillende duurzame innovaties.

Einde blok: Tussenkopje

Start van blok: Yvonne: Insecten burger

Q26
Hier ziet u een insectenburger. Deze burger heeft als hoofdingrediënt eetbare insecten. De aanwezigheid van deze insecten is niet detecteerbaar, omdat ze gevriesdroogd en gemalen worden. Ook zijn er verschillende groentes en kruiden aan de burger toegevoegd. Deze insectenburger is CO2-neutraal, wat het een duurzame vleesvervanger maakt.

E In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
De insectenburger roept irritatie bij me op. (1)	○	○	○	○	○
De insectenburger roept stress bij me op. (2)	○	○	○	○	○
De insectenburger roept frustratie bij me op. (3)	○	○	○	○	○

G In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
Ik zou NIET overstappen op de insectenburger. (1)	○	○	○	○	○
Ik zou de insectenburger zoveel mogelijk proberen te vermijden. (2)	○	○	○	○	○
Ik zou de insectenburger kopen. (3)	○	○	○	○	○

C In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
Ik ben kritisch over de insectenburger. (1)	○	○	○	○	○
Ik zie verschillende nadelen aan de insectenburger. (2)	○	○	○	○	○
Ik herken verschillende negatieve aspecten van de insectenburger. (3)	○	○	○	○	○

Einde blok: Yvonne: Insecten burger

Start van blok: Nikki: Kweekvlees burger

Q25

Hier ziet u een kweekvleesburger. De burger wordt ontwikkeld door middel van celkweektechnologie in het lab, op basis van dierlijke of plantaardige cellen. De kweekvleesburger is een duurzame vleesvervanger.

E In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
De kweekvleesburger roept irritatie bij me op. (1)	○	○	○	○	○
De kweekvleesburger roept stress bij me op. (2)	○	○	○	○	○
De kweekvleesburger roept frustratie bij me op. (3)	○	○	○	○	○

G In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
Ik zou NIET overstappen op de kweekvleesburger. (1)	○	○	○	○	○
Ik zou de kweekvleesburger zoveel mogelijk proberen te vermijden. (2)	○	○	○	○	○
Ik zou de kweekvleesburger kopen. (3)	○	○	○	○	○

C In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
Ik ben kritisch over de kweekvleesburger. (1)	○	○	○	○	○
Ik zie verschillende nadelen aan de kweekvleesburger. (2)	○	○	○	○	○
Ik herken verschillende negatieve aspecten van de kweekvleesburger. (3)	○	○	○	○	○

Einde blok: Nikki: Kweekvlees burger

Start van blok: Anne-sophie: Zeewier burger

Q27

Hier ziet u ‘The Weedburger’, een burger gemaakt van zeewier. Dit zeewier wordt duurzaam en lokaal geteeld in Nationaal Park Oosterschelde (NL). Voor de teelt van zeewier is geen landbouwgrond nodig, en slechts weinig zoetwater. Daarmee is de zeewierburger een duurzame vleesvervanger.

E In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
De zeewierburger roept irritatie bij me op. (1)	○	○	○	○	○
De zeewierburger roept stress bij me op. (2)	○	○	○	○	○
De zeewierburger roept frustratie bij me op. (3)	○	○	○	○	○

G In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
Ik zou NIET overstappen op de zeewierburger. (1)	○	○	○	○	○
Ik zou de zeewierburger zoveel mogelijk proberen te vermijden. (2)	○	○	○	○	○
Ik zou de zeewierburger kopen. (3)	○	○	○	○	○

C In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
Ik ben kritisch over de zeewierburger. (1)	○	○	○	○	○
Ik zie verschillende nadelen aan de zeewierburger. (2)	○	○	○	○	○
Ik herken verschillende negatieve aspecten van de zeewierburger. (3)	○	○	○	○	○

Einde blok: Anne-sophie: Zeewier burger

Start van blok: Manipulation check

Manipulation check In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigszins oneens (2)	Neutraal (3)	Enigszins eens (4)	Helemaal eens (5)
Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu. (1)	○	○	○	○	○
Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering. (2)	○	○	○	○	○
Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie. (3)	○	○	○	○	○

Einde blok: Manipulation check

Start van blok: Pro-environmental attitude

Moderator In hoeverre bent u het eens met de volgende stellingen?

	Helemaal oneens (1)	Enigzins oneens (2)	Neutraal (3)	Enigzins eens (4)	Helemaal eens (5)
We zijn de limiet aan het bereiken van het aantal mensen dat de aarde kan dragen. (1)	○	○	○	○	○
De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde NIET onleefbaar maken. (4)	○	○	○	○	○
Mensen maken sterk misbruik van het milieu. (5)	○	○	○	○	○
Planten en dieren hebben evenveel bestaansrechten als de mens. (7)	○	○	○	○	○
Het evenwicht van de natuur is sterk genoeg om te kunnen omgaan met de impact van de moderne industrie. (8)	○	○	○	○	○
De zogenaamde ‘ecologische crisis’ wordt sterk overdreven. (10)	○	○	○	○	○

De aarde is zoals een ruimteschip met een heel beperkte ruimte en beperkte bronnen. (11)	○	○	○	○	○
Mensen zijn bestemd om te heersen over de natuur. (12)	○	○	○	○	○
Het natuurlijke evenwicht is heel gevoelig en gemakkelijk verstoord. (13)	○	○	○	○	○
Als de zaken zich voortzetten op de huidige manier, zullen we binnenkort te maken krijgen met een enorme ecologische catastrofe. (15)	○	○	○	○	○

Einde blok: Pro-environmental attitude

Start van blok: Algemeen

Geslacht Wat is uw geslacht?

- ○ Man (1)
- ○ Vrouw (2)
- ○ Anders, namelijk (3) _____
- ○ Ik zeg dat liever niet (4)

Leeftijd Wat is uw leeftijd (in jaren)?

_____

Opleidinigsniveau Wat is uw hoogst behaalde opleidingsniveau?

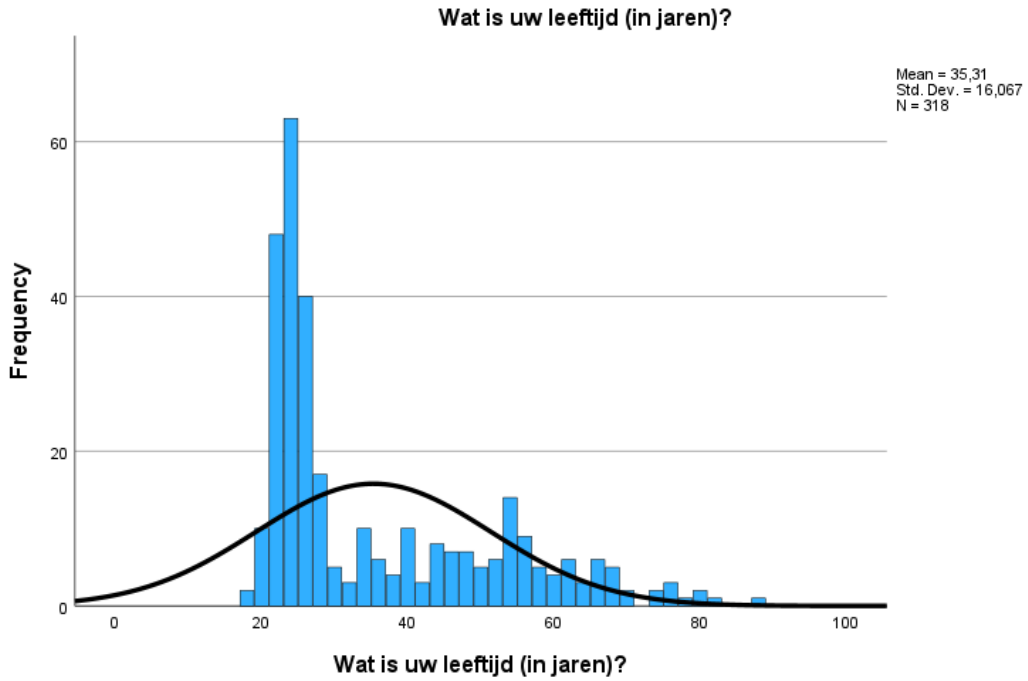
- ○ Geen opleiding (1)
- ○ Basisschool (2)
- ○ Middelbare school (3)
- ○ MBO (4)
- ○ HBO Bachelor (5)
- ○ HBO Master (6)
- ○ WO Bachelor (7)
- ○ WO Master (8)
- ○ PHD (9)

Einde blok: Algemeen

Appendix 7: SPSS output - Descriptives

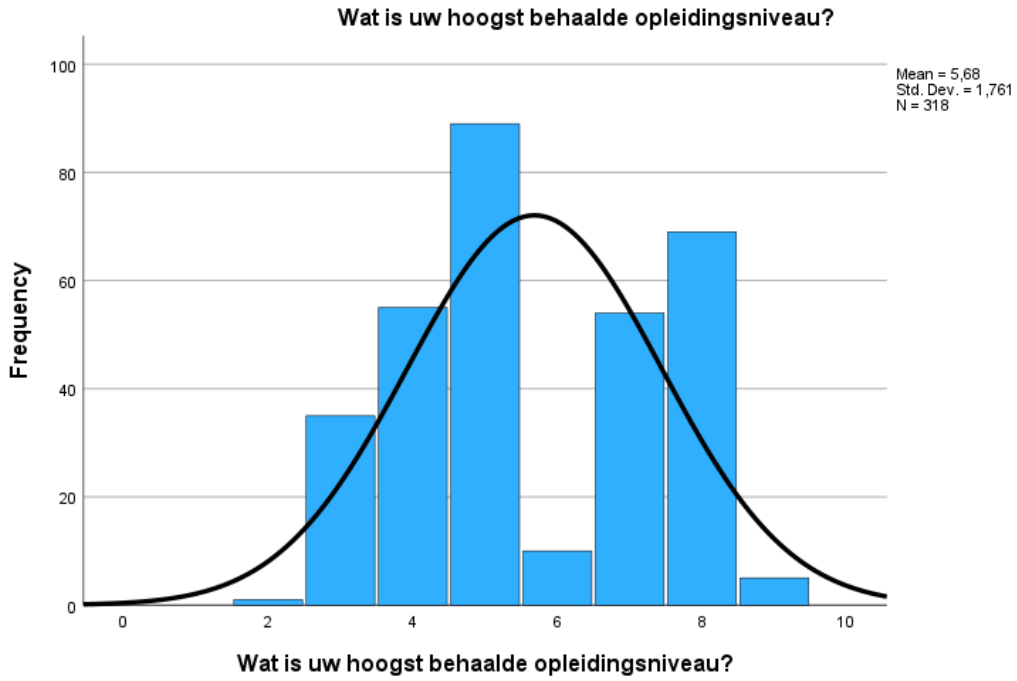
Wat is uw geslacht? - Selected Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Man	144	45,3	45,3	45,3
	Vrouw	173	54,4	54,4	99,7
	Anders, namelijk	1	,3	,3	100,0
	Total	318	100,0	100,0	



Wat is uw hoogst behaalde opleidingsniveau?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Basisschool	1	,3	,3	,3
	Middelbare school	35	11,0	11,0	11,3
	MBO	55	17,3	17,3	28,6
	HBO Bachelor	89	28,0	28,0	56,6
	HBO Master	10	3,1	3,1	59,7
	WO Bachelor	54	17,0	17,0	76,7
	WO Master	69	21,7	21,7	98,4
	PHD	5	1,6	1,6	100,0
	Total	318	100,0	100,0	



Statistics

		Wat is uw geslacht? - Selected Choice	Wat is uw leeftijd (in jaren)?	Wat is uw hoogst behaalde opleidingsniveau?
N	Valid	318	318	318
	Missing	0	0	0
Mean		1,55	35,31	5,68
Std. Error of Mean		,028	,901	,099
Std. Deviation		,505	16,067	1,761
Skewness		-,129	1,056	,087
Std. Error of Skewness		,137	,137	,137
Kurtosis		-1,803	-,013	-1,285
Std. Error of Kurtosis		,273	,273	,273

Appendix 8: SPSS output – Manipulation check

A: Assumptions MANOVA

Statistics

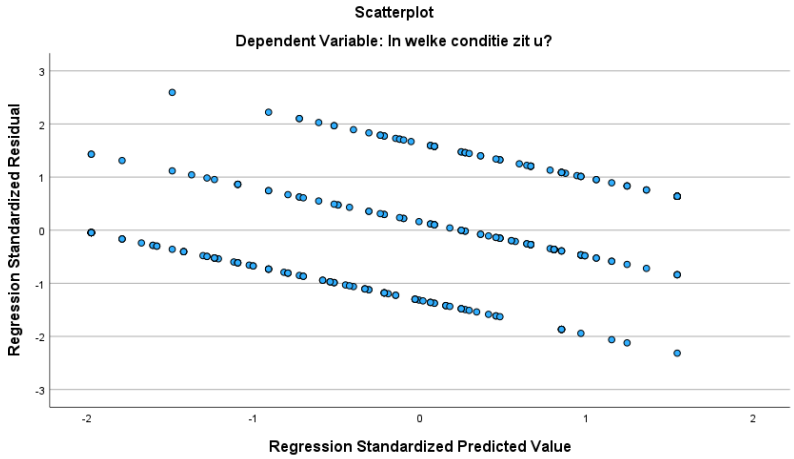
		In hoeverre bent u het eens met de volgende stellingen? - Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu.	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering.	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie.
N	Valid	318	318	318
	Missing	0	0	0
Mean		3,22	3,23	3,31
Std. Deviation		1,431	1,359	1,441
Skewness		-,242	-,280	-,379
Std. Error of Skewness		,137	,137	,137
Kurtosis		-1,338	-1,132	-1,200
Std. Error of Kurtosis		,273	,273	,273

Box's Test of Equality of Covariance Matrices[a]

Box's M	76,141
F	6,256
df1	12
df2	405320,835
Sig.	<,001

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + DigitalNudge



Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	,929	1360,949[b]	3,000	313,000	<,001	,929
	Wilks' Lambda	,071	1360,949[b]	3,000	313,000	<,001	,929
	Hotelling's Trace	13,044	1360,949[b]	3,000	313,000	<,001	,929
	Roy's Largest Root	13,044	1360,949[b]	3,000	313,000	<,001	,929
DigitalNudge	Pillai's Trace	,416	27,499	6,000	628,000	<,001	,208
	Wilks' Lambda	,612	29,024[b]	6,000	626,000	<,001	,218
	Hotelling's Trace	,588	30,558	6,000	624,000	<,001	,227
	Roy's Largest Root	,494	51,746[c]	3,000	314,000	<,001	,331

a. Design: Intercept + DigitalNudge

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

B: MANOVA of the manipulation check

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu.	182,669[a]	2	91,334	61,676	<,001	,281
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering.	164,917[b]	2	82,459	61,729	<,001	,282
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie.	73,005[c]	2	36,502	19,649	<,001	,111
Intercept	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu.	3390,735	1	3390,735	2289,667	<,001	,879
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering.	3413,897	1	3413,897	2555,671	<,001	,890
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie.	3555,196	1	3555,196	1913,766	<,001	,859
DigitalNudge	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu.	182,669	2	91,334	61,676	<,001	,281
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering.	164,917	2	82,459	61,729	<,001	,282
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie.	73,005	2	36,502	19,649	<,001	,111
Error	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu.	466,479	315	1,481			
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering.	420,781	315	1,336			
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie.	585,174	315	1,858			
Total	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu.	3953,000	318				
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering.	3896,000	318				
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie.	4145,000	318				
Corrected Total	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu.	649,148	317				
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering.	585,698	317				
	In hoeverre bent u het eens met de volgende stellingen? - Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie.	658,179	317				

a. R Squared = ,281 (Adjusted R Squared = ,277)
b. R Squared = ,282 (Adjusted R Squared = ,277)
c. R Squared = ,111 (Adjusted R Squared = ,105)

C: Post-hoc analysis

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) In welke conditie zit u?	(J) In welke conditie zit u?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
In hoeverre bent u het eens met de volgende stellingen? - Ik voel me aan de hand van de getoonde informatie in deze enquête voldoende geïnformeerd over de schadelijkheid van vleesconsumptie op het milieu.	Baseline	Priming	-1,56*	,160	<,001	-1,94	-1,18
		Priming*Goalsetting	-1,56*	,171	<,001	-1,96	-1,16
	Priming	Baseline	1,56*	,160	<,001	1,18	1,94
		Priming*Goalsetting	,00	,175	1,000	-,41	,41
	Priming*Goalsetting	Baseline	1,56*	,171	<,001	1,16	1,96
		Priming	,00	,175	1,000	-,41	,41
In hoeverre bent u het eens met de volgende stellingen? - Ik voel me bezorgd naar aanleiding van de getoonde informatie in deze enquête over klimaatverandering.	Baseline	Priming	-1,31*	,152	<,001	-1,67	-,96
		Priming*Goalsetting	-1,64*	,162	<,001	-2,03	-1,26
	Priming	Baseline	1,31*	,152	<,001	,96	1,67
		Priming*Goalsetting	-,33	,166	,118	-,72	,06
	Priming*Goalsetting	Baseline	1,64*	,162	<,001	1,26	2,03
		Priming	,33	,166	,118	-,06	,72
In hoeverre bent u het eens met de volgende stellingen? - Ik voel me gecommitteerd aan het doel om mee te werken aan het verminderen van vleesconsumptie.	Baseline	Priming	-,02	,180	,994	-,44	,40
		Priming*Goalsetting	-1,08*	,192	<,001	-1,53	-,63
	Priming	Baseline	,02	,180	,994	-,40	,44
		Priming*Goalsetting	-1,06*	,196	<,001	-1,53	-,60
	Priming*Goalsetting	Baseline	1,08*	,192	<,001	,63	1,53
		Priming	1,06*	,196	<,001	,60	1,53

Based on observed means.
The error term is Mean Square(Error) = 1,858.

*. The mean difference is significant at the ,05 level.

Appendix 9a: SPSS output – Reliability resistance scale

Emotional resistance:

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
In hoeverre bent u het eens met de volgende stellingen? - De kweekvleesburger roept irritatie bij me op.	3,95	6,215	,904	,915
In hoeverre bent u het eens met de volgende stellingen? - De kweekvleesburger roept stress bij me op.	4,08	7,097	,857	,950
In hoeverre bent u het eens met de volgende stellingen? - De kweekvleesburger roept frustratie bij me op.	4,05	6,492	,917	,904

Reliability Statistics

Cronbach's Alpha	N of Items
,948	3

Behavioral resistance:

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
In hoeverre bent u het eens met de volgende stellingen? - Ik zou NIET overstappen op de kweekvleesburger.	5,53	7,159	,901	,893
In hoeverre bent u het eens met de volgende stellingen? - Ik zou de kweekvleesburger zoveel mogelijk proberen te vermijden.	5,85	7,565	,867	,920
In hoeverre bent u het eens met de volgende stellingen? - Ik zou de kweekvlees kopen.	5,48	7,922	,862	,924

Reliability Statistics

Cronbach's Alpha	N of Items
,940	3

Cognitive resistance:

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
In hoeverre bent u het eens met de volgende stellingen? - Ik ben kritisch over de kweekvleesburger.	5,31	6,209	,817	,924
In hoeverre bent u het eens met de volgende stellingen? - Ik zie verschillende nadelen aan de kweekvleesburger.	5,62	6,117	,876	,876
In hoeverre bent u het eens met de volgende stellingen? - Ik herken verschillende negatieve aspecten van de kweekvleesburger.	5,75	6,332	,865	,886

Reliability Statistics

Cronbach's Alpha	N of Items
,928	3

Appendix 9b: SPSS output – Factor analysis resistance scale

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,900
Bartlett's Test of Sphericity	Approx. Chi-Square	3118,902
	df	36
	Sig.	<,001

Pattern Matrix[a]

	Factor		
	1	2	3
In hoeverre bent u het eens met de volgende stellingen? - De kweekvleesburger roept irritatie bij me op.	,019	,055	-,888
In hoeverre bent u het eens met de volgende stellingen? - De kweekvleesburger roept stress bij me op.	,059	,002	-,834
In hoeverre bent u het eens met de volgende stellingen? - De kweekvleesburger roept frustratie bij me op.	-,041	-,019	-1,006
In hoeverre bent u het eens met de volgende stellingen? - Ik zou NIET overstappen op de kweekvleesburger.	,058	,952	,053
In hoeverre bent u het eens met de volgende stellingen? - Ik zou de kweekvleesburger zoveel mogelijk proberen te vermijden.	,101	,761	-,120
In hoeverre bent u het eens met de volgende stellingen? - Ik zou de kweekvlees kopen.	-,082	,942	-,010
In hoeverre bent u het eens met de volgende stellingen? - Ik ben kritisch over de kweekvleesburger.	,811	,053	-,011
In hoeverre bent u het eens met de volgende stellingen? - Ik zie verschillende nadelen aan de kweekvleesburger.	,985	-,006	,057
In hoeverre bent u het eens met de volgende stellingen? - Ik herken verschillende negatieve aspecten van de kweekvleesburger.	,851	-,026	-,105

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 9 iterations.

Appendix 10a: SPSS output – Reliability NEP scale

Reliability Statistics

Cronbach's Alpha	N of Items
,836	10

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
In hoeverre bent u het eens met de volgende stellingen? - We zijn de limiet aan het bereiken van het aantal mensen dat de aarde kan dragen.	32,16	38,118	,527	,821
In hoeverre bent u het eens met de volgende stellingen? - De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde NIET onleefbaar maken.	33,36	41,889	,194	,851
In hoeverre bent u het eens met de volgende stellingen? - Mensen maken sterk misbruik van het milieu.	32,13	36,561	,686	,806
In hoeverre bent u het eens met de volgende stellingen? - Planten en dieren hebben evenveel bestaansrechten als de mens.	32,68	35,764	,528	,822
In hoeverre bent u het eens met de volgende stellingen? - Het evenwicht van de natuur is sterk genoeg om te kunnen omgaan met de moderne industrie	32,28	38,265	,536	,820
In hoeverre bent u het eens met de volgende stellingen? - De zogenaamde 'ecologische crisis' wordt sterk overdreven.	32,18	35,592	,681	,805
In hoeverre bent u het eens met de volgende stellingen? - De aarde is zoals een ruimteschip met een heel beperkte ruimte en beperkte bronnen.	32,41	38,318	,482	,825
In hoeverre bent u het eens met de volgende stellingen? - Mensen zijn bestemd om te heersen over de natuur.	32,34	38,054	,476	,826
In hoeverre bent u het eens met de volgende stellingen? - Het natuurlijke evenwicht is heel gevoelig en gemakkelijk verstoord.	32,45	38,627	,521	,822
In hoeverre bent u het eens met de volgende stellingen? - Als de zaken zich voortzetten op de huidige manier, zullen we binnenkort te maken krijgen met een enorme ecologische catastrofe.	32,47	35,638	,694	,804

Appendix 10b: SPSS output – Factor analysis NEP scale

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,869
Bartlett's Test of Sphericity	Approx. Chi-Square	1047,031
	df	45
	Sig.	<,001

Communalities

	Initial	Extraction
In hoeverre bent u het eens met de volgende stellingen? - We zijn de limiet aan het bereiken van het aantal mensen dat de aarde kan dragen.	,343	,319
In hoeverre bent u het eens met de volgende stellingen? - De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde NIET onleefbaar maken.	,072	,042
In hoeverre bent u het eens met de volgende stellingen? - Mensen maken sterk misbruik van het milieu.	,522	,583
In hoeverre bent u het eens met de volgende stellingen? - Planten en dieren hebben evenveel bestaansrechten als de mens.	,428	,359
In hoeverre bent u het eens met de volgende stellingen? - Het evenwicht van de natuur is sterk genoeg om te kunnen omgaan met de moderne industrie	,355	,347
In hoeverre bent u het eens met de volgende stellingen? - De zogenaamde 'ecologische crisis' wordt sterk overdreven.	,548	,581
In hoeverre bent u het eens met de volgende stellingen? - De aarde is zoals een ruimteschip met een heel beperkte ruimte en beperkte bronnen.	,355	,269
In hoeverre bent u het eens met de volgende stellingen? - Mensen zijn bestemd om te heersen over de natuur.	,294	,253
In hoeverre bent u het eens met de volgende stellingen? - Het natuurlijke evenwicht is heel gevoelig en gemakkelijk verstoord.	,322	,320
In hoeverre bent u het eens met de volgende stellingen? - Als de zaken zich voortzetten op de huidige manier, zullen we binnenkort te maken krijgen met een enorme ecologische catastrofe.	,559	,616

Extraction Method: Principal Axis Factoring.

(PEA2 communallities of <.20)

Factor Matrix[a]

	Factor 1
In hoeverre bent u het eens met de volgende stellingen? - We zijn de limiet aan het bereiken van het aantal mensen dat de aarde kan dragen.	,559
In hoeverre bent u het eens met de volgende stellingen? - Mensen maken sterk misbruik van het milieu.	,768
In hoeverre bent u het eens met de volgende stellingen? - Planten en dieren hebben evenveel bestaansrechten als de mens.	,606
In hoeverre bent u het eens met de volgende stellingen? - Het evenwicht van de natuur is sterk genoeg om te kunnen omgaan met de moderne industrie	,586
In hoeverre bent u het eens met de volgende stellingen? - De zogenaamde 'ecologische crisis' wordt sterk overdreven.	,765
In hoeverre bent u het eens met de volgende stellingen? - De aarde is zoals een ruimteschip met een heel beperkte ruimte en beperkte bronnen.	,512
In hoeverre bent u het eens met de volgende stellingen? - Mensen zijn bestemd om te heersen over de natuur.	,500
In hoeverre bent u het eens met de volgende stellingen? - Het natuurlijke evenwicht is heel gevoelig en gemakkelijk verstoord.	,563
In hoeverre bent u het eens met de volgende stellingen? - Als de zaken zich voortzetten op de huidige manier, zullen we binnenkort te maken krijgen met een enorme ecologische catastrofe.	,789

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 5 iterations required.

Appendix 11: SPSS output – MANOVA analysis

A: Assumptions check

Statistics

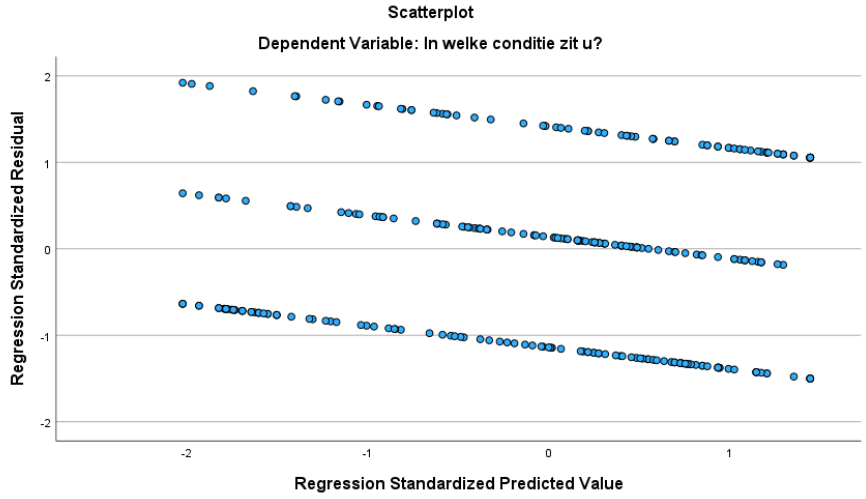
		Emotional resistance	Behavioral resistance	Cognitive resistance
N	Valid	318	318	318
	Missing	0	0	0
Mean		2,01	2,81	2,78
Std. Deviation		1,268	1,354	1,225
Skewness		1,011	,254	,051
Std. Error of Skewness		,137	,137	,137
Kurtosis		-,273	-1,249	-1,101
Std. Error of Kurtosis		,273	,273	,273

Box's Test of Equality of Covariance Matrices[a]

Box's M	78,246
F	6,429
df1	12
df2	405320,835
Sig.	<,001

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + DigitalNudge



Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	,868	685,035[b]	3,000	313,000	<,001	,868
	Wilks' Lambda	,132	685,035[b]	3,000	313,000	<,001	,868
	Hotelling's Trace	6,566	685,035[b]	3,000	313,000	<,001	,868
	Roy's Largest Root	6,566	685,035[b]	3,000	313,000	<,001	,868
DigitalNudge	Pillai's Trace	,166	9,480	6,000	628,000	<,001	,083
	Wilks' Lambda	,840	9,492[b]	6,000	626,000	<,001	,083
	Hotelling's Trace	,183	9,503	6,000	624,000	<,001	,084
	Roy's Largest Root	,121	12,661[c]	3,000	314,000	<,001	,108

a. Design: Intercept + DigitalNudge

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

B: MANOVA analysis

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Emotional resistance	31,109[a]	2	15,554	10,233	<,001	,061
	Behavioral resistance	38,419[b]	2	19,210	11,155	<,001	,066
	Cognitive resistance	20,957[c]	2	10,478	7,258	<,001	,044
Intercept	Emotional resistance	1230,376	1	1230,376	809,419	<,001	,720
	Behavioral resistance	2381,423	1	2381,423	1382,845	<,001	,814
	Cognitive resistance	2358,973	1	2358,973	1634,049	<,001	,838
DigitalNudge	Emotional resistance	31,109	2	15,554	10,233	<,001	,061
	Behavioral resistance	38,419	2	19,210	11,155	<,001	,066
	Cognitive resistance	20,957	2	10,478	7,258	<,001	,044
Error	Emotional resistance	478,823	315	1,520			
	Behavioral resistance	542,467	315	1,722			
	Cognitive resistance	454,745	315	1,444			
Total	Emotional resistance	1800,667	318				
	Behavioral resistance	3092,333	318				
	Cognitive resistance	2933,111	318				
Corrected Total	Emotional resistance	509,932	317				
	Behavioral resistance	580,886	317				
	Cognitive resistance	475,702	317				

a. R Squared = ,061 (Adjusted R Squared = ,055)

b. R Squared = ,066 (Adjusted R Squared = ,060)

c. R Squared = ,044 (Adjusted R Squared = ,038)

C: Post-hoc analysis

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) In welke conditie zit u?	(J) In welke conditie zit u?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Emotional resistance	Baseline	Priming	,66*	,162	<,001	,28	1,04
		Priming*Goalsetting	,62*	,173	,001	,21	1,03
	Priming	Baseline	-,66*	,162	<,001	-1,04	-,28
		Priming*Goalsetting	-,04	,177	,970	-,46	,37
	Priming*Goalsetting	Baseline	-,62*	,173	,001	-1,03	-,21
		Priming	,04	,177	,970	-,37	,46
Behavioral resistance	Baseline	Priming	,06	,173	,945	-,35	,46
		Priming*Goalsetting	,80*	,184	<,001	,37	1,24
	Priming	Baseline	-,06	,173	,945	-,46	,35
		Priming*Goalsetting	,75*	,188	<,001	,31	1,19
	Priming*Goalsetting	Baseline	-,80*	,184	<,001	-1,24	-,37
		Priming	-,75*	,188	<,001	-1,19	-,31
Cognitive resistance	Baseline	Priming	,45*	,158	,013	,08	,82
		Priming*Goalsetting	,60*	,169	,001	,20	,99
	Priming	Baseline	-,45*	,158	,013	-,82	-,08
		Priming*Goalsetting	,15	,172	,672	-,26	,55
	Priming*Goalsetting	Baseline	-,60*	,169	,001	-,99	-,20
		Priming	-,15	,172	,672	-,55	,26

Based on observed means.
The error term is Mean Square(Error) = 1,444.

*. The mean difference is significant at the ,05 level.

Appendix 12: SPSS output – Moderation analysis

Priming → Emotional resistance

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.2 *****************

      Written by Andrew F. Hayes, Ph.D.      www.afhayes.com
  Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 1
   Y  : ER
   X  : Con_1
   W  : NEP

Sample
Size:  318

**************************************************************************
OUTCOME VARIABLE:
 ER

Model Summary
       R     R-sq      MSE    F(HC3)      df1      df2        p
    ,5414    ,2931   1,1479  40,7365   3,0000  314,0000    ,0000

Model
          coeff   se(HC3)        t        p     LLCI     ULCI
constant   2,1174    ,0740   28,5951    ,0000   1,9717   2,2631
Con_1      -,3414    ,1309   -2,6082    ,0095   -,5990   -,0839
NEP       -1,0202    ,0957  -10,6657    ,0000  -1,2085   -,8320
Int_1      ,6589    ,2529    2,6058    ,0096    ,1614   1,1565

Covariance matrix of regression parameter estimates:
          constant     Con_1      NEP     Int_1
constant     ,0055    -,0055    -,0007     ,0007
Con_1        -,0055     ,0171     ,0007    -,0086
NEP          -,0007     ,0007     ,0092    -,0092
Int_1        ,0007    -,0086    -,0092     ,0639

Test(s) of highest order unconditional interaction(s):
     R2-chng    F(HC3)      df1      df2        p
X*W    ,0235    6,7900   1,0000  314,0000    ,0096
----------
   Focal predict: Con_1    (X)
      Mod var: NEP      (W)

Conditional effects of the focal predictor at values of the moderator(s):

     NEP    Effect   se(HC3)        t        p     LLCI     ULCI
   -,7191   -,8153    ,2502   -3,2585    ,0012  -1,3076   -,3230
    ,0000   -,3414    ,1309   -2,6082    ,0095   -,5990   -,0839
    ,7191    ,1324    ,1945    ,6810    ,4964   -,2502    ,5150
```

Priming → Cognitive resistance

```
**************************************************************************
Model  : 1
   Y  : CR
   X  : Con_1
   W  : NEP

Sample
Size:  318

**************************************************************************
OUTCOME VARIABLE:
 CR

Model Summary
       R     R-sq      MSE    F(HC3)      df1       df2         p
   ,3862    ,1491    1,2891   19,9885    3,0000   314,0000     ,0000

Model
           coeff   se(HC3)        t        p      LLCI      ULCI
constant   2,8239    ,0780   36,2172    ,0000    2,6705    2,9773
Con_1      -,1551    ,1400   -1,1076    ,2689    -,4305    ,1204
NEP        -,7117    ,0967   -7,3579    ,0000    -,9020    -,5214
Int_1       ,4102    ,2289    1,7919    ,0741    -,0402    ,8606

Product terms key:
 Int_1   :      Con_1   x      NEP

Covariance matrix of regression parameter estimates:
          constant     Con_1      NEP     Int_1
constant     ,0061    -,0061     ,0007    -,0007
Con_1        -,0061    ,0196    -,0007    -,0065
NEP          ,0007    -,0007     ,0094    -,0094
Int_1       -,0007    -,0065    -,0094     ,0524
```

```
Test(s) of highest order unconditional interaction(s):
     R2-chng    F(HC3)       df1       df2         p
X*W     ,0098    3,2109    1,0000   314,0000     ,0741
----------
   Focal predict: Con_1   (X)
      Mod var: NEP     (W)

Conditional effects of the focal predictor at values of the moderator(s):

      NEP    Effect   se(HC3)        t        p      LLCI      ULCI
   -,7191    -,4500     ,2369   -1,8999    ,0584    -,9161    ,0160
    ,0000    -,1551     ,1400   -1,1076    ,2689    -,4305    ,1204
    ,7191     ,1399     ,1931    ,7247    ,4692    -,2400    ,5198

There are no statistical significance transition points within the observed
range of the moderator found using the Johnson-Neyman method.
```

Priming combined with goal setting → Emotional resistance

```
Model : 1
  Y : ER
  X : Con_2
  W : NEP

Sample
Size: 318

**************************************************************************
OUTCOME VARIABLE:
 ER

Model Summary
      R     R-sq      MSE    F(HC3)      df1       df2        p
  ,5204    ,2709   1,1841   35,6395    3,0000   314,0000    ,0000

Model
          coeff   se(HC3)        t        p     LLCI     ULCI
constant  2,0543    ,0735   27,9523    ,0000   1,9097   2,1989
Con_2      -,1978    ,1381   -1,4323    ,1531   -,4696    ,0739
NEP        -,9886    ,1060   -9,3306    ,0000   -1,1971   -,7801
Int_1       ,4495    ,1915    2,3476    ,0195    ,0728    ,8263

Product terms key:
 Int_1   :      Con_2   x      NEP

Covariance matrix of regression parameter estimates:
          constant     Con_2       NEP     Int_1
constant    ,0054    -,0054     ,0001    -,0001
Con_2       -,0054    ,0191    -,0001    -,0077
NEP         ,0001    -,0001    ,0112    -,0112
Int_1      -,0001    -,0077    -,0112    ,0367
```

```
Conditional effects of the focal predictor at values of the moderator(s):

     NEP    Effect   se(HC3)        t        p     LLCI     ULCI
  -,7191    -,5211    ,2217   -2,3505    ,0194   -,9574   -,0849
   ,0000    -,1978    ,1381   -1,4323    ,1531   -,4696    ,0739
   ,7191    ,1254    ,1641    ,7645    ,4452   -,1974    ,4483

Moderator value(s) defining Johnson-Neyman significance region(s):
    Value   % below   % above
  -,2597   30,5031   69,4969
```

Priming combined with goal setting → Cognitive resistance

```
   Y : CR
   X : Con_2
   W : NEP

Sample
Size: 318

**************************************************************************
OUTCOME VARIABLE:
 CR

Model Summary
      R     R-sq      MSE    F(HC3)      df1       df2        p
   ,3894    ,1516    1,2852   24,8800    3,0000  314,0000    ,0000

Model
         coeff   se(HC3)        t        p      LLCI      ULCI
constant   2,8546    ,0732   39,0108    ,0000    2,7107    2,9986
Con_2      -,3050    ,1550   -1,9673    ,0500    -,6101    ,0000
NEP        -,6757    ,0865   -7,8149    ,0000    -,8459    -,5056
Int_1       ,2703    ,2247    1,2030    ,2299    -,1718    ,7123

Product terms key:
 Int_1   :       Con_2   x      NEP

Covariance matrix of regression parameter estimates:
         constant     Con_2       NEP     Int_1
constant    ,0054    -,0054     ,0010    -,0010
Con_2       -,0054    ,0240    -,0010    -,0066
NEP         ,0010    -,0010     ,0075    -,0075
Int_1       -,0010   -,0066    -,0075     ,0505
```

Priming combined with goal setting → Behavioral resistance

```
  Y : BR
  X : Con_2
  W : NEP

Sample
Size: 318

**************************************************************************
OUTCOME VARIABLE:
 BR

Model Summary
      R     R-sq      MSE    F(HC3)      df1       df2         p
   ,5017    ,2517    1,3844   47,9808    3,0000  314,0000     ,0000

Model
          coeff   se(HC3)        t        p      LLCI      ULCI
constant   2,9846    ,0786   37,9850    ,0000    2,8300    3,1392
Con_2      -,6673    ,1588   -4,2022    ,0000    -,9797    -,3548
NEP        -,8688    ,1001   -8,6830    ,0000   -1,0657    -,6719
Int_1       ,2556    ,2133    1,1986    ,2316    -,1640    ,6752

Product terms key:
 Int_1   :      Con_2   x      NEP

Covariance matrix of regression parameter estimates:
          constant     Con_2      NEP     Int_1
constant    ,0062    -,0062    ,0030    -,0030
Con_2       -,0062    ,0252    -,0030    -,0076
NEP         ,0030    -,0030    ,0100    -,0100
Int_1      -,0030    -,0076    -,0100    ,0455
```