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The Effect of a Plant-Based Default on Food Choice Behaviour: Exploring the Role of Endorsement

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Abstract

Meat consumption places a heavy burden on the environment, and exposes humans to increased risk for different diseases and disorders. To reduce meat consumption, restaurants are potential impactful settings to target as the proportion of meat that is consumed out-of-home is relatively high in high-income countries. There are different interventions to reduce meat consumption, and one particularly effective intervention is the default nudge. The default option refers to a choice option that is pre-selected in some way, and is therefore framed as the standard. In this study, the restaurant menu was subtly re-designed to make plant-based options the perceived default, examining whether consumer selection of plant-based options would increase. Next to this, the mediating role of endorsement was investigated, as this is suggested to be a relevant underlying mechanism of the default. The mechanism effort was also measured, but rather exploratively to see if this would strengthen the effect of endorsement. An online experiment in the Netherlands showed that consumers chose the plant-based options more often relative to meat when the plant-based option was framed as the default. Moreover, insignificant results for both endorsement and effort suggests that endorsement does not necessarily operate, or plays a significant role as an underlying mechanism of a plant-based default, and that effort does not strengthen the effect of endorsement. However, future research is necessary to investigate the mechanisms further, also examining contextual moderators to develop more targeted and impactful interventions to reduce meat consumption.

Keywords: default nudge, plant-based meat alternatives, meat consumption, restaurants

Introduction

Shifting production and consumption in today's global economy away from environmental exploitation towards more sustainable patterns ranks amongst the most crucial challenges of the 21st century (Forrest & Kearns, 2001). Meat consumption is in particular challenging in this regard as it places a heavy burden on the environment (Godfray et al., 2018). As a major greenhouse gas emitter, tackling the consumption of meat products will be important to achieve the target that is set by the European Union. This target requires an 80-95% reduction in greenhouse gas emissions needed by 2050 (Weidema et al., 2008). Aside from being a major greenhouse gas emitter, meat consumption is a major driver of deforestation and worldwide biodiversity loss (Watson et al., 2019), and contributes to the local pollution of water, soil, and air (Poore & Nemecek. 2018). Moreover, meat products exposes humans to saturated fat, cholesterol and pathogenic microorganisms, while displacing fiber, complex carbohydrates, antioxidants, and other components needed for health. In the process, consumption of meat products increases the risk for cardiovascular disease, cancer, diabetes, obesity, and other disorders (Barnard & Leroy, 2020). Plant-based foods, on the other hand, require considerably less water and land while they produce less greenhouse gases (Chai et al., 2019), and are considered beneficial to health as they are associated with reduced risk of chronic disease and improved quality of life (Bouvard et al., 2015).

Last year (2022), approximately 38 kilograms of meat per person was consumed in the Netherlands (Dagevos et al., 2022). "Every year it fluctuates here and there by an ounce or kilo, but the decrease that is so badly needed is not forthcoming" (Molenaar, 2022, introduction section). While the market for meat substitutes in the Netherlands has been growing rapidly in recent years, the adoption of meat substitutes has not been as widespread as expected. Several reasons have been proposed as to why this is the case. Onwezen et al. (2019) indicates that some consumers find the taste, texture and appearance of meat substitutes less appealing compared to traditional meat products, which may deter them from fully embracing these alternatives. Other reasons mentioned by studies are cost considerations, lack of awareness and accessibility of meat substitutes (Hoek et al., 2013; De Boer et al., 2014). Reducing meat consumption is however, necessary, as a transition toward more plant-based food is a major lever to enhance human health and environmental sustainability (Dagevos & Voordouw, 2013).

Next to meat substitutes, there are a lot of other interventions to reduce meat consumption. These take a multifaceted approach, recognizing that reducing meat consumption is influenced by a variety of individual, social, and environmental factors (Stoll-Kleemann & Schmidt, 2016). One approach to reduce meat consumption is through interventions influenced

by individual factors that target knowledge (gaps), built on the logic that more information and knowledge on a specific issue will change attitudes and consequently behaviour of individual consumers (Stoll-Kleemann & Schmidt, 2016). Increasing consumers' awareness of issues around meat consumption should help them to form understanding of and commitment to meat reduction (Dagevos & Voordouw, 2013). Another individual factor that was frequently addressed by intervention studies relates to fostering skills. A lack of skills about how to shop, prepare and cook meatless dishes might act as a barrier to reduce meat consumption (Stoll-Kleemann & Schmidt, 2016). Emotions, cognitive dissonance, attitudes, and habits are among other individual factors that are commonly addressed in intervention studies. Interventions influenced by social factors may consider societal norms and values. Moreover, interventions influenced by environmental factors, may consider making vegetarian food more visible, changing portion sizes of meals, or setting vegetarian meals as the default option (Stoll-Kleemann & Schmidt, 2016). Although the scholarly discourse on consumption-based interventions intensified in the last years, there is still a relative paucity of experimental research testing the effectiveness of different intervention options. There is a pressing need for a robust evidence base on the effectiveness of various interventions to foster meat consumption reduction (Kwasny et al., 2022).

An interesting intervention to investigate, influenced by environmental factors, is 'nudging'. A nudge is any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives (Thaler & Sunstein, 2009). Nudging aims to influence people's behaviours by changing the way an individual choice is presented, without restrictions or consumer awareness of the influence (Vandenbroele et al., 2020). Nudging is one of the complementary strategies acknowledged for successful behaviour change and can easily be implemented (Appleton et al., 2016). One particularly effective nudge is the default nudge (Meier et al., 2022). Defaults are among the most discussed behavioural policies and have proven their effectiveness in various decision-making settings (Hummel & Maedche, 2019; Jachimowicz et al., 2019). The default option refers to a choice option that is pre-selected in some way (Johnson & Goldstein, 2003), and is therefore framed as the standard (Bergeron et al., 2019). The '*green*' default can be described as the default choice that is designed to be environmentally or sustainability oriented (Sunstein & Reisch, 2013). The green default has been studied in areas such as environmentally friendly household electricity supply (Pichert & Katsikopoulos, 2008), healthy food (Wansink & Hanks, 2013), and proper waste disposal (Fielding et al., 2012), among others. The green default nudge that will be used in this study is to frame the plant-based option on a restaurant

menu as the default. Restaurants are a potentially impactful setting to target as many consumers in high-income countries increasingly consume meals out-of-home, and the proportion of meat that is consumed out-of-home is relatively high (Attwood & Hajat, 2020). The basic approach here is to make the plant-based option the easy, desirable, social, and timely choice, while preserving consumers' freedom of choice by leaving all choice options on the menu (Liu & Chapman, 2013). Preserving freedom of choice is important as reactance can be provoked when individuals' freedom is threatened, which can make them motivated to do the exact opposite of what an appeal intended (de Vaan et al., 2019).

Most of the time, meat is the go-to default option on the menu. When meat options have a more visible location on the menu (Kurz, 2018) or when a menu states that plant-based alternatives for meat are also available, but on request (Gravert & Kurz, 2021), it could strengthen the perception among consumers that meat is the default. By changing the default in the mind of consumers, behaviours that occur without much conscious deliberation can potentially be changed. Therefore, in this current study, an experimental condition with a meat default and an experimental condition with a plant-based default will be investigated. It is expected that the experimental condition with the implementation of a green default that frames the plant-based option as the default is effective in promoting the plant-based option on a restaurant menu, compared to the experimental condition with the implementation of a meat default (H1, figure 1).

Defaults seem to primarily operate through three major, but not mutually exclusive, underlying mechanisms (Jachimowicz et al., 2019; Johnson & Goldstein, 2003). First, there is endowment which refers to the decision maker acting as if they have already chosen the default option and will consider it a reference point (Jachimowicz, 2019). Second, there is the mechanism of effort. This means that choosing the default is less work than choosing to switch to the alternative. Lastly, there is endorsement as an underlying mechanism. Endorsement refers to individuals perceiving the choice architect's implementation of a nudge as being in their best interest, leading them to view it as a recommendation. Individuals may also view it as a socially expected choice (Jachimowicz, 2019) as Thaler and Sunstein (2009) propose that the default selected by policymakers might be interpreted as an indication of what the majority chooses, and that following a heuristic of imitation could lead to its widespread adoption. The efficacy of a default option is however, influenced by the decision-makers' perception of the architect of the choice and their attitude towards this perceived choice architect. For example, one study finds that defaults are less effective when individuals do not trust the choice architect because the individuals believe that the choice design was based on intentions differing from their own

(Tannenbaum et al., 2017). The more decision makers believe that the default reflects a trusted recommendation (perceive endorsement) the more effective the default is likely to be (Jachimowicz et al., 2019).

A systematic review of Meier et al. (2022) supposes that the mechanism of endowment is not as relevant as effort and endorsement, in the context of plant-based options. They found as in the studies considered in the review, that individuals' perception of being endowed with the default was presumably relatively low. Moreover, as many people associate eating meat with tradition, pleasure, and satisfaction (Biermann & Rau, 2020), even if the meat-free default were perceived as an endowment, this would not necessarily be perceived positively. In another meta-analysis by Jachimowicz et al. (2019) it is found that defaults operating through endowment or endorsement are more effective than defaults operating through effort. This is due to the fact that individuals may be especially motivated to seek out novel information or otherwise exert effort to ascertain their decision in cases where decision importance is high (Jachimowicz et al., 2019). A side note is that this meta-analysis investigates the effectiveness of defaults across various domains such as environment, consumer choice and health, but does not examine defaults that influence food choices in the context of plant-based options. Nevertheless, endorsement emerges as a mechanism that is of high relevance in both the systematic review as the meta-analysis. It is intriguing to explore whether endorsement plays a role in the context of green defaults and meat reduction in this current study.

An interesting study resembling this study has been done by Taufik et al. (2022). They studied the green default in an online experiment and in a field experiment in the Netherlands. Both had a 2 x 2 between-subjects experimental design. They tested whether re-designing the restaurant menu, so that plant-based meat alternatives were perceived as the default to a greater extent, increased consumer selection of plant-based meat alternatives. Both the online experiment and field experiment showed that consumers choose plant-based alternatives more often relative to meat when the plant-based option is framed as the default. This means that redesigning the menu in a way that suggests that plant-based meat alternatives are the default, is a promising route to promote out-of-home adoption of plant-based meat alternatives in restaurants. Taufik and colleagues (2022) emphasized that little is known about the potential underlying mechanisms and that there is a need for studies to examine these mechanisms. Moreover, to my knowledge, and also mentioned in the systematic review by Meier et al. (2022), there are no studies that measure the underlying mechanisms of the default.

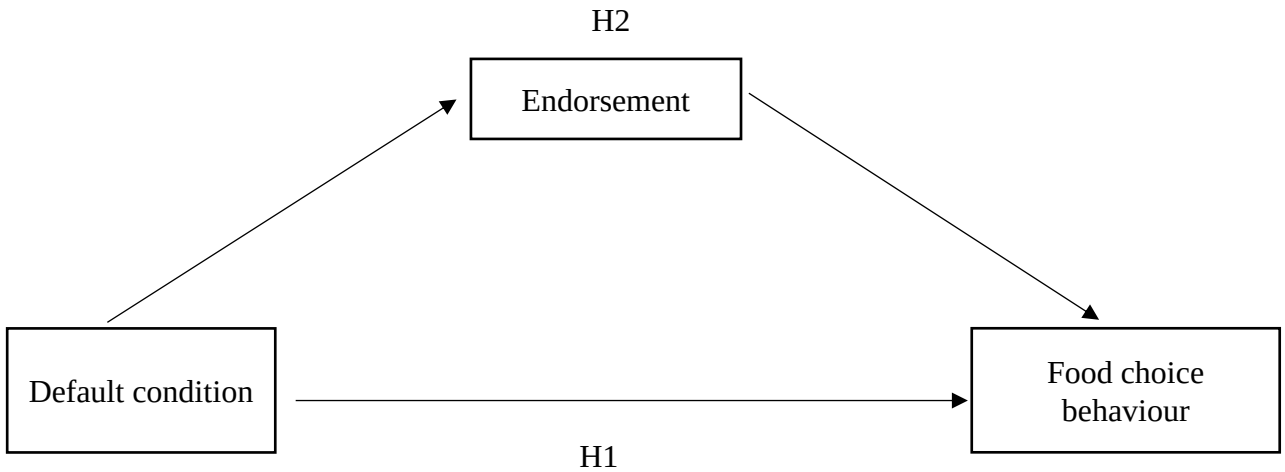
More insight in these underlying mechanisms can contribute to explain under which conditions a default nudge is particularly effective (Taufik et al., 2022). Thus, understanding

the mediating role of endorsement in this current study can provide valuable insights for designing effective interventions and promoting plant-based options in restaurant settings. On top of that, most studies analyze actual rather than hypothetical meat consumption in field experiments. A shortcoming of such a study design is the difficulty to collect additional data on participants' characteristics to better understand for whom and how the intervention might work (Meier et al., 2022). This current hypothetical meat consumption experimental study investigating endorsement as an underlying mechanism through a questionnaire can better understand how the intervention might work. As endorsement seems to be an effective mechanism of defaults, it is expected that the plant-based default nudge has an increased effect on endorsement, which has an effect on choosing a plant-based option on the restaurant menu (H2, figure 1).

To conclude, the food environment has been shown to be impactful in consumers' decision-making and testing if the green default works while investigating the underlying mechanism endorsement, could foster meat consumption reduction. This reduction is very needed as this can make consumers' lives more sustainable and healthier. Therefore, with an online experiment, the following research question will be investigated: Is a plant-based default nudge able to promote the plant-based option on the menu and is this effect mediated by endorsement? (See figure 1).

Figure 1

Conceptual Model of Mediation



Method

Participants

Participants were recruited through a convenience and selective sampling method and were approached through social media. Conditions for participating in the study was that the participant must be residing in the Netherlands and be 18 years old or older. For the sample size calculation, a power analysis was performed with program G*Power 3.1.9.7 with the following input: statistical test = goodness-of-fit test; effect size w = 0.25; $\alpha = 0.05$; power $(1-\beta) = 0.8$; Df: 1. The estimated effect size used for the power analysis is based on previous meta-analyses on defaults which on average have a medium effect size. A meta-analysis by Jachimowicz (2019) reveals a considerable influence of defaults with a Cohen's d of 0.68 which is a medium to large effect size and a meta-analysis by Mertens et al. (2021) shows that choice architecture interventions overall promote behaviour change with a Cohen's d of 0.43, which is a small to medium effect size. By using the power analysis, a sample size of 126 was determined. In total, there were 176 respondents, but the final sample size consisted of 134 participants. The exclusion of participants is described in the data analysis. 42 participants identified as male, and 92 as female. The average age was 34, ranging from 19 to 78 years old. To increase the number of participants, collaboration was established with another researcher that also studied a plant-based default versus a meat default. In this collaboration, data was collected together. The questionnaire has been approved and ethically reviewed by the Faculty Ethics Review Committee under approval number 23-0310. The complete questionnaire can be found in Appendix A.

Design

The study was conducted online in the Netherlands, and the data was obtained through an online experiment in English using Qualtrics as survey tool. The study had a between-subjects experimental design to explore the effect of a green default nudge on a restaurant menu, also measuring endorsement as a mediator.

Procedure

Participants were first informed about participation through an informed consent (see Appendix B) and were made aware that participation was entirely voluntary. During the online questionnaire, the anonymity of participants was ensured at all times. Additionally, participation could be refused without giving reasons and could be terminated prematurely. When the participant agreed to participate, they first read the text '*Please imagine that you want*

to eat something with your friend. You decide to look for available restaurants in the neighbourhood. You find a restaurant of your choice and sit down at the designated table.' A photo was also added which showed a restaurant with a neutral look (see Appendix C). By adding this text and photo, it was sought to create a choice environment that was as close as possible to a real dish-ordering situation. There were two different nudge conditions, and participants were randomly assigned at the beginning of the questionnaire to either the restaurant menu with the plant-based option as the default, or to the restaurant menu with the meat option as the default. In the first condition, a menu design was shown, were the plant-based options were the default on the menu. Underneath every separate option the following text was added: '*Rather have (meat option)? This is also possible on request'* (see Appendix D for this menu design). In the second condition, the menu design was shown where the meat options were the default on the menu. Underneath every separate option the following text was added: '*Rather have (vegetarian option)? This is also possible on request'* (see Appendix E for this menu design). Then, the participants read the text '*You see the menu handed to you at the table by the waiter/waitress. You would like to order a main course. On the menu, you see the following options. Please look at the menu carefully.*' This was followed by the question, '*the waiter/waitress comes over to write down your choice. What would you like to order as your main course?*' (See Appendix A for the questionnaire). After this question, a manipulation check question was asked. This was followed by questions measuring 'Implied Endorsement', 'Effort', 'Person- and Location-Bound Preferences' and 'Meat Attachment'. The survey was part of a larger study of food choice behaviour and only the constructs 'Implied Endorsement' and 'Effort' were used in this study to answer the research question and hypotheses. At the end of the questionnaire, demographic information such as age, gender, education level and country of residence was collected to obtain a good understanding of the population. Lastly, the participant was asked if they were vegetarian, vegan or pescetarian to check whether all participants complied with the inclusion criteria. After completing the questionnaire, participants were thanked for participation, and were debriefed about the aim of this study (see Appendix F).

Measures

Endorsement

The questionnaire that was used to measure endorsement was motivated by McKenzie et al. (2006) and Dinner et al. (2011). In these studies endorsement was referred to as 'implied endorsement'. Each participant was asked to report their agreement on a 7-point Likert scale

(-3 = Strongly Disagree to +3 = Strongly Agree) with the following two statements after their decision: Direct Implied Endorsement: "*I made my choice because the chef appeared to want me to select that option*." External Implied Endorsement: *"I made my choice because I thought about what most people would do*." McKenzie et al. (2006) focused primarily on 'Direct Implied Endorsement', while the test from Dinner et al. (2011) also included 'External Implied Endorsement'. With these two statements, it can be examined to what extent participants perceive it as a trusted recommendation, and to what extent they perceive it as the socially expected choice. In the experiment of Dinner et al. (2011) the statement for 'Direct Implied Endorsement' originally was: "*I made my choice because the contractor appeared to want me to select that option",* changing the word of 'contractor' into 'chef' in this current study as the plant-based default on a menu is investigated, whereas Dinner et al. (2011) investigated the default in the context of different light bulbs.

Effort

It was decided to measure effort as well, but rather exploratively. Effort was measured with the question: 'I made my choice because it was easier to choose that option' (Dinner et al., 2011). It was not included as a mediator because literature suggests that it would likely not have a significant effect on choosing the plant-based option (Jachimowicz et al., 2019). It is however expected that effort is correlated with implied endorsement, as Meier et al. (2022) mention that both effort and endorsement are particularly relevant when the decision is perceived as complicated or when morality plays a role. In this context, morality could play a role as eating meat can involve ethical considerations on the treatment of animals and on the environmental impact of animal agriculture (Bacon & Krpan, 2018).

Data-analysis

The hypotheses were investigated through a quantitative study. This study included (out of home consumer) food choice (plant-based option, meat option) as a dependent variable; default condition (plant-based default, meat default) as an independent variable, and endorsement as a mediator (see Figure 1). The obtained data were analysed using the software program 'SPSS Statistics 28'. Prior to analysis, the data of each participant were inspected for missing values, outliers, and demographic information. Missing values can result in inaccurate final scores for the respective participant. If a participant had not completed the questionnaire in full, they were excluded from the analysis (n = 27). Individuals who followed a vegan/vegetarian/pescetarian diet were excluded from the study (n = 5). If the participant did

not reside in the Netherlands, they were excluded from the study (n = 2). Lastly, participants were excluded that did not answer 'disagree' to the control question (n = 8).

For the first hypothesis a chi-squared test of independence was done to compare the condition with the meat default to the condition with the plant-based default. The purpose of this test was to see whether the plant-based default was able to promote the plant-based option on the menu. There are several assumptions that must be met for this test. First, the variables should be measured at an ordinal or nominal level. This assumption is met as the two variables are categorical. Second, all observations must be independent. This assumption is also met as the value of one observation in the dataset does not affect the value of any other observation. Third, the sample size must be sufficiently large. For every cell of the contingency table, there must be at least 5 expected observations. This assumption has been checked and is met (McHugh, 2013).

A mediation analysis has been done using PROCESS Hayes 4.1 in SPSS (Hayes, 2012), to test the second hypothesis that endorsement mediates the relationship between the plant-based default condition and choosing a plant-based option. First, the statements for 'Direct Implied Endorsement', 'External Implied Endorsement' and 'Effort' were computed into different variables. These statements were measured on a Likert scale. Neither disagree nor agree (4) transformed into value 0. Agreed (1-3) transformed into value 1 and disagreed (4-7) transformed into value 2 (McKenzie, 2006). Next to this, it was tested whether the variables 'Implied Endorsement' and 'Effort' were correlated with each other, to see whether 'Implied Endorsement' would be added separately or together with 'Effort' to the model. Before doing the mediation analysis, there are multiple assumptions that need to be met. First, the data should be independent of each other. There should be no systematic relationship or dependency between cases. This assumption is met. Second, the sample size must be large enough. This assumption is also met (VanderWeele & Vansteelandt, 2014). In PROCESS, Model 4 was chosen and a total of 5000 bootstrap samples were drawn to obtain robust estimates of the indirect effect and assess its significance. Next to that, for confidence intervals 95 was chosen. For options, the total effect model, effect size and standardized coefficients was selected.

Results

Randomization check

To check whether randomization of participants across the two nudge conditions was successful, we first examined the descriptive statistics. The plant-based default condition contained 67 participants, and the meat-based default condition contained 67 participants as well. This means that there was an equal distribution between the two conditions. Furthermore, a chi-squared test revealed no significant differences between the groups in terms of gender. The plant-based condition and the meat condition both counted 21 males and 46 females ($\chi 2$ = .000, df = 1, p = 1). Similarly, a chi-squared test for educational level also showed no significant differences between the two groups ($\chi 2$ = 4.242, df = 6, p = .644). However, an independent t-test showed that there was a significant difference for age between the two groups ($t(132)$ = 1.988, p = .049), with a higher age in the plant-based condition (M= 36.97, SD = 17.326) as compared to the meat condition (M = 31.54, SD = 14.141).

Manipulation check

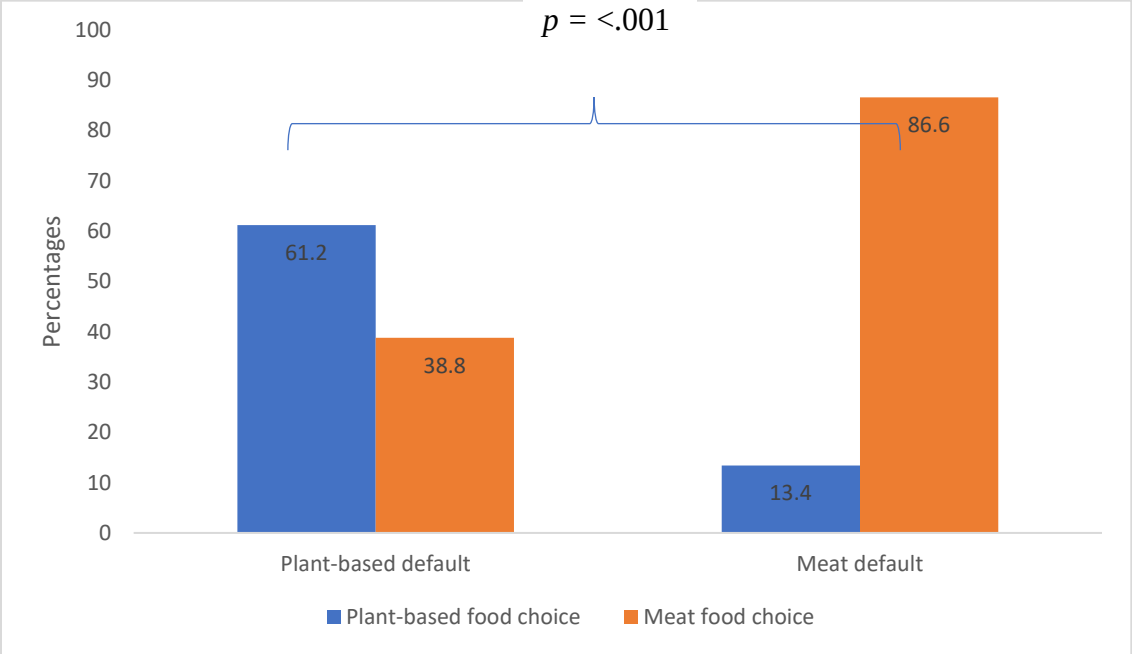
To check whether participants in the plant-based default condition indeed perceived the plant-based options as the default, more so than participants in the meat default condition, a manipulation check was done. An independent samples t-test showed that participants in the plant-based default condition indeed perceived the plant-based option as being the default to a greater extent (M = 1.39, SD = .49) relative to participants in the default meat condition (M = 1.86, SD = .34); $t(122)$ = -6.52, p < .001. The value of the plant-based option was represented as 1, and the meat option was represented as 2.

Hypothesis 1

A chi-square test of independence was conducted to test the first hypothesis. The crosstabs chi-square test revealed that type of nudge condition was significantly associated with out-of-home consumer food choice, $\chi 2$ (1, n = 134) = 32.67, p = < .001, ϕ = .49. This shows a relatively strong effect. This means that participants in the plant-based nudge condition chose one of the plant-based options more often relative to participants in the meat default condition (see figure 2).

Figure 2

Percentages of Plant-Based versus Meat Option Chosen



Hypothesis 2

For hypothesis 2, it was first checked whether the statements for endorsement and effort were correlated with each other. 'Direct Implied Endorsement' and 'Effort' were found to be moderately positively correlated, $r(132) = .287$, $p = <.001$. Next to that, 'External Implied Endorsement' and 'Effort' were also found to be moderately positively correlated, $r(132) = .215$, $p = .013$. Because the statements affect each other, they are added to the mediation analysis all at once, using PROCESS macro (VanderWeele & Vansteelandt, 2014). However, first a mediation analysis was conducted with only 'Direct Implied Endorsement' and 'External Implied Endorsement' to measure the construct endorsement. The direct effect of the default condition on food choice behaviour was significant ($\beta = 2.230$, SE = .442, $p < .001$), indicating that the presence of the default condition influenced participants' choices. The indirect effect of 'Direct Implied Endorsement' was insignificant ($\beta = .124$, *SE* = .112, 95% CI [-.027, .398]), just as the indirect effect of 'External Implied Endorsement'($\beta = .013$, *SE* = .084, 95% CI [-.066, .184]). The combined indirect effect of 'Direct Implied Endorsement' and 'External Implied Endorsement' was also insignificant ($\beta = .137$, *SE* = .135, 95% CI [-.020, .448]).

Moreover, a mediation analysis was done testing 'Direct Implied Endorsement', 'External Implied Endorsement' and 'Effort' in one model. The indirect effect of 'Effort' was

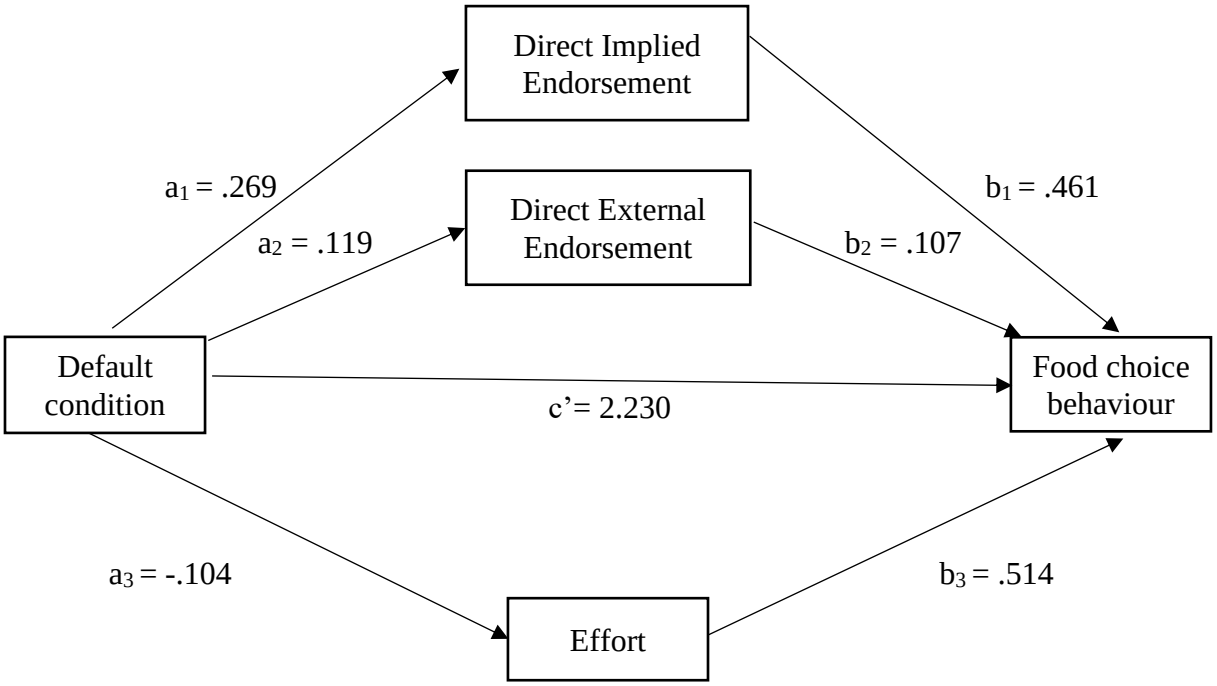
insignificant (β = -.054, *SE* = .072, 95% CI [-.210, .090]). The combined indirect effect of 'Direct Implied Endorsement', 'External Implied Endorsement', and 'Effort' was also insignificant (β = 0.035, *SE* = .161, 95% CI [-.193, .381]) (see Table 2 and Figure 3).

Table 2
Direct and Indirect Effects of the Mediation Analysis

			95% CI	
n = 134	β	*SE*	Lower	Upper
Direct effect				
Default condition on food choice behaviour	2.230	.442	1.363	3.097
Indirect effect				
Direct Implied Endorsement	.124	.112	-.027	.398
External Implied Endorsement	.013	.084	-.066	.184
Direct Implied Endorsement x External Implied Endorsement	.137	.135	-.020	.448
Effort	-.054	.072	-.210	.090
Effort x Direct Implied Endorsement x External Implied Endorsement	.035	.161	-.193	.381

Figure 3

Mediation Analysis with Effect Sizes



Note. The effect sizes are expressed as beta weights

Discussion

A transition toward more plant-based food is a major lever to enhance human health and environmental sustainability. Especially meat consumption is a challenge as it places a heavy burden on the environment and exposes humans to increased risk for different diseases and disorders. As the decrease that is needed is not forthcoming, interventions are needed to make this transition happen. Nudging considers environmental factors, is one of the complementary strategies acknowledged for successful behaviour change and can easily be implemented. Reducing meat consumption is particularly important in out-of-home, restaurant settings, as the level of meat consumption is relatively high here. This current study demonstrated that subtly re-designing the menu in a way that frames the plant-based options as the default is effective, as participants in the plant-based default condition chose one of the plant-based options significantly more often (61.2%) relative to participants in the meat default condition (13.4%). This shows that participants in the plant-based default condition were approximately 4.5 times more likely to opt for a plant-based option, compared to participants in the meat default condition. The effect size (Cramer's V) showed a relatively strong effect. This effect is in line with the meta-analysis by Jachimowicz et al. (2019) revealing a medium to large effect size by defaults. The current study extends previous research that provided initial evidence that reversing the default from meat-based to plant-based via a subtle re-design of a restaurant menu can be effective (Campbell-Arvai et al., 2012; Gravert & Kurz., 2021). In the study of Campbell-Arvai et al. (2014) it was shown that the use of a default menu increased the probability that study participants would choose a meat-free option. All participants receiving a default menu were informed that they could also consult a second menu that was posted on the wall approximately 3.5 m away from their table if they wished to select a food option that was different from the ones on the default menu. In the study of Gravert and Kurz (2021), they also tested the effect of rearranging the menu in favor of vegetarian food. They tested this by adding a sentence on the menu of a restaurant, saying that an option containing meat is available on request. Customers could ask the waiter what the meat/vegetarian dish was in order to consider it along with the options spelled out on the menu. Compared to the studies of Campbell-Arvai et al. (2014) and Gravert & kurz (2021), this current study preserved freedom of choice more, adding to the literature, by leaving meat options and plant-based options on the same menu and explicitly describing what the alternative options were on the menu. This current study also preserved freedom of choice more so than the study of Taufik et al. (2022), by having three meat options and three vegetarian options to choose from, whereas in the study

of Taufik and colleagues (2022), there was only one plant-based option and one meat option to choose from.

The default has been proven to be effective in many different settings (Hummel & Maedche, 2019; Jachimowicz et al., 2019), and also in this particular context. It is however possible that the sociodemographic factors can partly explain the significant effect found in this current study. Sociodemographic factors regarding gender, age and educational background still play a role in the transition to plant-based diets. First, it has been shown that women, young people and people with higher education are less neophobic (Jaeger et al., 2021). Moreover, young age and high educational level are associated with health consciousness and awareness of the environmental impacts of food production (Siegrist & Hartmann, 2019). In this current study we had significantly more women than men (92 against 42), the average age of the participants was rather low (with an average age of 34), and most people had a high educational level (110 participants had an educational level of HBO or higher).

Next to the significant effect found for the plant-based default, this study showed that individuals' endorsement did not mediate the effect of the default nudge on consumers' plant-based selections. This suggests that endorsement does not necessarily operates, or has a big role as an underlying mechanism of a plant-based default. Although not expected, it was found to be partly in line with the literature, as Dinner et al. (2011) also found that higher levels of 'Direct Implied Endorsement' and 'External Implied Endorsement' had no effect on choosing the default option. However, because Dinner et al. (2011) investigated the default in context of light bulbs, and past research (Johnson & Goldstein, 2003; McKenzie et al. 2006; Meier et al. 2022) has suggested that endorsement is a mechanism of high relevance, it was still interesting to investigate endorsement in this study as an underlying mechanism of the plant-based default. One potential explanation for the lack of a significant effect, is that the statements might not have represented endorsement sufficiently. First, to measure the construct, there were only two statements in total. According to Hair et al. (2010), a minimum of three is necessary to provide minimum coverage of the construct's theoretical domain. Next to that, the questionnaire used in this study was not validated, and the reliability of the questions have never been tested as there is no Cronbach's alpha mentioned. Hair et al. (2010) defined reliability as an assessment of the degree of consistency between multiple measurements of a variable. Right now, there is no questionnaire measuring endorsement that has been confirmed as validated and reliable. Moreover, Taufik et al. (2022) suggest that, in a real-life restaurant setting, the endorsement mechanism could be strengthened because consumers perceive the restaurant to endorse the pre-selected choice. In an online study, strengthening this mechanism might be

more difficult to achieve. Next to this, it is important to note that the impact of endorsement to be induced is also affected by the strength of individuals' attitudes and preferences, which were not measured in this study. Those who strongly prefer a meal or product containing meat are less likely to stick with the meat-free default despite perceived endorsement or increased effort. Lastly, the impact of endorsement to be induced can also be affected by contextual moderators, i.e., characteristics of the intervention design (Meier et al., 2022).

Furthermore, the role of effort was measured exploratively. First, it is important to note that there was a positive correlation found between 'Implied Endorsement' and 'Effort'. However, there was no significant interaction effect found of 'Effort' and 'Implied Endorsement', which means that effort does not seem to strengthen the effect of endorsement. In other words, the impact of endorsement did not become more pronounced based on the level of effort invested by individuals. These results are partly in line with the literature, as Dinner et al. (2011) also found no significant impact of 'Direct Implied Endorsement', 'External Implied Endorsement' and 'Effort'. Here, the same applies as for endorsement. Dinner et al. (2011) investigated defaults in context of light bulbs and not food choices, and literature has suggested that effort is one of the three main underlying mechanisms of the default (Johnson & Goldstein, 2003; McKenzie et al. 2006; Meier et al. 2022). 'Effort' was measured with only one item, which might have not provided enough coverage of the constructs' theoretical domain (Hair et al., 2010). Moreover, it was not a validated questionnaire and there was no Cronbach's alpha mentioned. The same applies here for effort as for endorsement, that there has not been a validated questionnaire developed to measure effort in the context of a default. This is also mentioned in the systematic review of Meier et al. (2022), as none of the studies in this review were designed to pin down the underlying mechanisms.

Next to the limitations for measuring endorsement and effort, there are a few other limitations, but also strengths, to this study that are worth mentioning. First, a substantial drawback may be that, rather than examining actual dining behaviour, only hypothetical dish choices in an online setting were investigated. It is questionable whether the results can be generalized from the online setting to real dining situations (Betz et al., 2022). With this study a decisive conclusion can not be made about how defaults would work in a real restaurant setting. However, we have tried to increase generalizability by having three plant-based options and three meat options, in comparison to other studies only having one meat and one plant-based option (Taufik et al., 2022; Hielkema & Lund, 2022). Having multiple options to choose from on the menu is more realistic to an actual restaurant menu, and preserves people's freedom of choice.

Moreover, the participants were randomly assigned to one of the two conditions. Randomization improves the generalizability of the study findings because the effects found are less likely to be attributed to specific characteristics of the participants. The randomization check showed that randomization was successful as there were no differences in gender and educational level between the groups. Although a small significant effect in age was observed (M = 36.97 for the plant-based default condition, M = 31.54 for the meat default condition) it is believed that this did not impact the results of the study. According to Szenderák et al. (2022) those under 45 years of age are the most likely consumers of plant-based alternatives. Therefore it is believed that this difference in age for the two groups are still in the same range to being open to try plant-based alternatives. Lastly, the fact that the participants' choice behaviours had no actual consequences (they did not eat the dish they had ordered) for them involves a relatively high risk of unauthentic response tendencies in terms of social desirability or consistency (Falk & Zimmerman, 2013). Given the study's reliance on self-assessed measures, response bias could potentially be a concern. There are many reasons individuals might offer biased estimates of self-assessed behaviour, ranging from a misunderstanding of what a proper measurement is to social-desirability bias, where the respondent wants to make a good impression in the survey, even if the survey is anonymous (Rosenman et al., 2011). At the same time, artificial settings are more controllable in terms of the effects to be investigated because several confounding variables can be excluded, e.g. the presence of other diners, including the sight and smell of what they have ordered (Betz et al., 2022).

In view of these considerations, this study opens up new avenues for future research. First, validated and reliable questionnaires should be developed to investigate endorsement, effort, and endowment, as literature suggests that these are the three main underlying mechanisms of the default. More insight in these mechanisms can contribute to explain under which conditions a default nudge is particularly effective, which can further reduce meat-consumption. Moreover, the endorsement mechanism may be better investigated in a real-life restaurant setting, with a real waiter and chef, which can lead to people trusting the choice architect more than online. Another future research option is to examine the underlying mechanisms in combination with contextual moderators as the activation of these mechanisms is influenced by these moderators. Meier et al. (2022) identify four contextual moderators that appear to systematically alter the impact, namely the default's invasiveness, the recognisability and presentation of the alternative, and the objective of the study setting, which affects the intention with which individuals engage in the setting. Understanding the underlying mechanisms and contextual moderators that influence the effectiveness of default

nudges can form more targeted and impactful interventions by policymakers, restaurants or organizations, aimed at reducing meat consumption.

To conclude, much can be gained from both an environmental and health perspective, if consumers would proportionally eat less meat and more plant-based foods, such as plant-based meat alternatives. This study demonstrates how a low-cost, easy to implement and effective default nudge increases the proportion of plant-based options adopted relative to equivalent meat options in a restaurant. This means that a subtle re-design of the menu can already make plant-based options the default in the mind of consumers, contributing to making plant-based alternatives a more often chosen dish in out-of-home, restaurant settings. Future research can contribute to developing more targeted and impactful interventions by investigating *how* and *when* defaults exactly work.

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Appendix A

Complete questionnaire

Please imagine that you want to eat something with your friend. You decide to look for available restaurants in the neighbourhood. You find a restaurant of your choice and sit down at the designated table.

End of Block: Restaurant setting

Start of Block: Condition 1: Plant-based Default nudge

You see the menu handed to you at the table by the waiter/waitress. You would like to order a main course. On the menu, you see the following options. Please look at the menu carefully.

The waiter/waitress comes over to write down your choice. What would you like to order as your main course?

- ○ Vegan chicken burger
- ○ Bean burger
- ○ Vegan burger
- ○ I would like to request a chicken burger
- ○ I would like to request a beef burger
- ○ I would like to request a lamb kebab

Page Break

Manipulation check
The default option is the selection that is automatically chosen for a dish unless a specific alternative is requested by the customer.

Based on your experience, looking at the (vegan) chicken burger on the menu, which of the two burgers was the more default option on the menu to choose as a main course?

- ○ Chicken burger
- ○ Vegan chicken burger

End of Block: Condition 1: Plant-based Default nudge

Start of Block: Condition 2: Meat Default

You see the menu handed to you at the table by the waiter/waitress. You would like to order a main course. On the menu, you see the following options. Please look at the menu carefully.

The waiter/waitress comes over to write down your choice. What would you like to order as your main course?

- ○ Chicken burger
- ○ Beef burger
- ○ Kebab
- ○ I would like to request a vegan chicken burger
- ○ I would like to request a bean burger
- ○ I would like to request a vegan kebab

Page Break

Manipulation check
The default option is the selection that is automatically chosen for a dish unless a specific alternative is requested by the customer.

Based on your experience, looking at the (vegan) chicken burger on the menu, which of the two burgers was the more default option on the menu to choose as a main course?

- ○ Chicken burger
- ○ Vegan chicken burger

End of Block: Condition 2: Meat Default

Start of Block: Implied endorsement & effort

Please indicate to what extent you agree with the statements below.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I made my choice because the chef appeared to want me to select that option.	○	○	○	○	○	○	○
I made my choice because I thought about what most people would do.	○	○	○	○	○	○	○
I made my choice because it was easier to choose that option.	○	○	○	○	○	○	○

End of Block: Implied endorsement & effort

Start of Block: Person- and location-bound preferences

Please indicate to what extent you agree with the following statement:
When buying a main course in a restaurant, choosing one with meat in it is something that...

	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree
... I do often	○	○	○	○	○
... is typically me	○	○	○	○	○
... I do without thinking about it	○	○	○	○	○

End of Block: Person- and location-bound preferences

Start of Block: Meat attachment

Please indicate the answer you prefer

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
To eat meat is one of the good pleasures in life.	○	○	○	○	○
Meat is irreplaceable in my diet.	○	○	○	○	○
According to our position in the food chain, we have the right to eat meat.	○	○	○	○	○
I feel bad when I think of eating meat.	○	○	○	○	○
I love meals with meat.	○	○	○	○	○
To eat meat is disrespectful towards life and the environment.	○	○	○	○	○
To test whether you are still reading all the answers carefully, indicate 'Disagree' here.	○	○	○	○	○
To eat meat is an unquestionable right of every person.	○	○	○	○	○

A good steak is without comparison.	○	○	○	○	○
I would feel fine with a meatless diet.	○	○	○	○	○
I'm a big fan of meat.	○	○	○	○	○
If I could'nt eat meat I would feel weak.	○	○	○	○	○
If I was forced to stop eating meat I would feel sad.	○	○	○	○	○
Meat reminds me of diseases.	○	○	○	○	○
By eating meat I'm reminded of the death and suffering of animals.	○	○	○	○	○
Eating meat is a natural and undisputable practice.	○	○	○	○	○
I don't picture myself without eating meat regularly.	○	○	○	○	○

End of Block: Meat attachment

Start of Block: Demographics and background questions

Lastly, some demographic and background questions will be asked.

What is your age in years?

_____

What is your gender?

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ Prefer not to say

What is the highest level of school you have completed or the highest degree you have received?

- ○ Less than high school degree
- ○ High school degree or equivalent
- ○ Middle-level applied education (MBO)
- ○ University of Applied Sciences degree (HBO)
- ○ University Bachelor degree
- ○ University Graduate/Masters degree
- ○ PhD or higher

In which country do you currently reside?

▼ Netherlands ... Zimbabwe

Are you a vegetarian, vegan or pescatarian? (A pescatarian does not eat meat, but does eat fish)

- ○ Yes
- ○ No

Skip To: End of Survey If Are you a vegetarian, vegan or pescatarian? (A pescatarian does not eat meat, but does eat fish) = Yes

End of Block: Demographics and background questions

Start of Block: Debriefing

Appendix B

Informed consent

Dear participant,

I hereby invite you to participate in an online study about out-of-home eating behaviour conducted as part of the Master Social, Health, and Organisational Psychology, Utrecht University. We are going to ask you to take a look at a restaurant menu and make a choice about what you would like to order. After that, we have some more questions about your food choice behaviour.

To participate in this study you must be at least 18 years old and be a resident of the Netherlands. You cannot participate in this study if you eat vegetarian (no meat and fish), vegan (no animal products at all) or pescatarian (no meat). You can close the survey if any of these apply to you.

The questionnaire takes about 5 minutes.

The study will be in English, so we suggest you only proceed if you are comfortable reading materials and answering questions in English. Participation is entirely voluntary. You can stop your participation at any time without negative consequences.

Your data will be collected anonymously and stored safely by Utrecht University for at least 10 years after publication. The data may be used in scientific and professional publications.

Your data is used for this research project on out-of home food choices, as well as for further research in the field of social psychology. The anonymised data may be shared with others and stored at a data archive such as DANS to facilitate the use of the data in future research.

If you would like to receive more information about the study or have any questions, now or in the future, you can contact Eline Nijeboer (e.e.nijeboer@students.uu.nl) or Milou Rutenfrans (m.a.rutenfrans@students.uu.nl). If you have any complaints, please contact the FETC: complaints officer-fetcsocwet@uu.nl In advance, thank you for your time!

Do you want to participate in this study? By clicking the "yes" button, you indicate that you have read and understood the above information and agree to participate in this study.

- ○ Yes
- ○ No

Skip To: End of Survey If Dear participant, I hereby invite you to participate in an online study about out-of-home eating... = No

Appendix C

Restaurant picture

Appendix D

Menu Design Plant-Based Default

Appendix E

Menu Design Meat Default

Appendix F

Debriefing

Thank you for your time and for completing this questionnaire!

Do not forget to click the yellow button at the bottom of the page to end the survey!

Below you will find more information about the purpose of the study, which you can read if you find it interesting.

We could not inform you from the start about the aim of this survey, because this could have influenced your choices during the experiment. The aim of this survey was to examine the effects of default nudges on consumer behaviour, specifically looking at the impact of a plant-based (vegan) default option versus a meat default option on a restaurant menu. We had two experimental conditions. You were either placed in the meat-default condition, or in the plant-based default condition.

A plant-based default on a restaurant menu refers to a default (standard) option that is vegan in nature, with no meat or animal products included in the dish. This means that when you order a meal from the menu, the default option presented to you would be a vegan dish. You can still choose to order a meat-containing dish if you desire, but you would have to actively select that option (ask for a meat dish). For the meat default, this would be the other way around where you would have to actively ask for a vegan dish.

A default (standard) option for a plant-based option can steer people to making more sustainable options. This type of default option is designed to encourage customers to make more sustainable or healthy food choices by making it easier and more convenient to choose a vegan option. We could not inform you from the start about the aim of this survey, because this could have influenced your choices during the experiment.

If you have any questions about the purpose or further course of the study, you can always contact the researchers.

Eline Nijeboer (e.e.nijeboer@students.uu.nl)
Milou Rutenfrans (m.a.rutenfrans@students.uu.nl)

End of Block: Debriefing