To Veg or Not to Veg?

The Impact of Framing on Vegetarian Food Choice

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Abstract

Research suggests that consuming vegetarian foods is one of the key lifestyle changes that could reduce greenhouse gas emissions. However, transforming dietary habits to counter climate change has received little attention to date compared to other green behaviors. In three large pre-registered online studies conducted on 11,066 US participants, the present research tested whether reframing the name of the vegetarian food category impacts the choice of dishes from this category in the context of restaurant menus. We showed that a pro-environmental frame (i.e. "Environmentally Friendly Main Courses for a Happy Planet"), a social frame (i.e. "Refreshing Main Courses for Relaxing Conversations"), and a neutral frame (i.e. vegetarian and non-vegetarian dishes mixed in the same section "Main Courses") all increased the likelihood of vegetarian choice compared to a vegetarian frame (i.e. "Vegetarian Main Courses"). Given that either of the three framing conditions (vs. the vegetarian frame) increased vegetarian food choice but no consistent differences emerged among them, the main message of the present research is that the absence of vegetarian framing, regardless of the alternative intervention, may make vegetarian choices more likely. In addition to testing the main effects of menus on vegetarian choice, we comprehensively examined the mechanism behind these effects by probing multiple mediators. Overall, our research offers new insights into how techniques stemming from psychology can enhance vegetarian food choice.

Keywords: Environment, social support, vegetarian, menu, framing.

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1. Introduction

A report published by the UN Intergovernmental Panel on Climate Change (IPCC; 2018) estimated that global warming is likely to reach 1.5°C above pre-industrial levels between 2030-2052 if it continues increasing at the current rate. Reaching this stage will significantly elevate the risks of floods, extreme heat, drought, and poverty. Eating less meat and farmed fish and more vegetarian foods is one of the key lifestyle changes that could reverse this trend (Clark & Tilman, 2017; Dubois et al., 2019; McMichael, Powles, Butler, & Uauy, 2007). However, relative to other green behaviors such as recycling, transforming dietary habits to tackle climate change has received little attention to date from both policy makers and psychologists (Clayton et al., 2015; Dubois et al., 2019; Stern, 2011; Wynes & Nicholas, 2017).

Some of the key psychological insights on how to change food-related decision making involve that placing foods on more salient locations (e.g. in a supermarket, on a menu, or in an online grocery store), increasing food availability, or reframing dish names to make them more appealing increases the likelihood of choice (Breugelmans, Campo, & Gijsbrechts, 2007; Dayan & Bar-Hillel, 2011; Garnett, Balmford, Sandbrook, Pilling, & Marteau, 2019; Rozin et al., 2011; Turnwald, Boles, & Crum, 2017). In the present article, we go beyond previous research by investigating whether reframing the name of the vegetarian food category but without changing the names or descriptions of dishes belonging to this category can influence their choice. More precisely, the focus is on testing whether using a pro-environmental frame (i.e. emphasizing environmental benefits of vegetarian foods) and a social frame (i.e. linking vegetarian foods to social experience of dining) instead of the category label “vegetarian” can influence the choice of dishes from this category.

We examined this in the context of restaurant menus, considering that this is a relatively straightforward environment for investigating vegetarian food choice because barriers typically associated with this food type, such as effort or lack of knowledge in food preparation, are absent (Pohjolainen, Vinnari, & Jokinen, 2015). In the next section, we first review previous research on framing and food decision making and then proceed with developing the hypotheses regarding the specific interventions used in the present research.

1.1. Framing and Food Choice

Several studies have tested how framing of various food items shapes their liking and choice. One of the main insights arising from these studies is that using indulgent words to reframe the names or descriptions of healthy foods that are typically not perceived as tasty influences how people respond to them (Cadario & Chandon, 2019; Turnwald et al., 2019). Turnwald, Jurafsky, Conner, and Crum (2017) researched dish names from the menus of 100 top-selling chain restaurants in the US in 2015 and found that the descriptions of healthy dishes are less likely to contain appealing words (e.g. crispy) than the descriptions of standard dishes. To test whether such differences in descriptions can impact food choice, Turnwald, Boles, and Crum (2017) conducted a study in a large university cafeteria and showed that reframing the names of vegetables to make them more attractive (e.g. from “beets” to “dynamite chili and tangy lime-seasoned beets”) made people more likely to choose them for lunch.

This technique has been used to influence evaluations and choice of foods beyond vegetables. Making dish names more appealing by including words associated with taste and emotions (e.g. “tender grilled chicken” instead of “grilled chicken”) increased the positivity of attitudes toward these dishes and made people generate more positive comments about them (Wansink, Painter, & Ittersum, 2001; Wansink, Van Ittersum, & Painter, 2005). Moreover, in

vitro meat (IVM) that is grown from animal cells was perceived more positively when framed as "clean meat" versus "lab grown meat", which also increased people's intentions to eat it (Bryant & Barnett, 2019). Finally, replacing "beef" and "pork" with "cow" and "pig" in restaurant menu names reduced willingness to eat meat by evoking empathy toward animals and disgust toward meat eating (Kunst & Hohle, 2016). This in turn made people more willing to choose an alternative vegetarian dish.

However, there are several limitations that impede making general conclusions regarding the type of framing that may influence food choice and under what circumstances. First, various studies failed to find an effect of framing on food-related decision making. For example, reframing "Grilled assorted vegetable dinner with quinoa" into "Chef's special: A hearth-baked mélange of assorted flavorful seasoned vegetables nestled on quinoa" did not impact university students' menu selections (Feldman, Su, Mahadevan, Brusca, & Hartwell, 2014; see also Dos Santos et al., 2018, 2019, and Zhou et al., 2019). Second, apart from one exception (Turnwald et al., 2019), studies were typically not pre-registered, which increases the chance of false positive findings (Wagenmakers, Wetzels, Borsboom, van der Maas, & Kievit, 2012). Third, in some studies many different framing interventions were analyzed together (e.g. Wansink et al., 2001; Turnwald, Boles, & Crum, 2017), so it is unclear which ones accounted for the effects. Finally, different food types and names were used across the studies, and it is possible that some of the effects occurred due to specific dishes with which the interventions were combined.

In the present research, beyond implementing pre-registration (Van't Veer & Giner-Sorolla, 2016) and focusing on precise framing interventions, we posit that a more general understanding of the impact of framing on food choice can be achieved by reframing the names of food categories (e.g. vegetarian) rather than of specific dishes. This is because various dishes can be

included within a category to understand whether there is an overall effect of the manipulation across a range of these foods. In the next section, we provide the rationale behind the framing interventions used in the present research and specify the predictions.

1.2. Reframing "Vegetarian" to Influence Food Choice

Drawing on previous framing research which showed that including words associated with enjoyment in dish names can increase vegetarian choice (e.g. Turnwald et al., 2019), we decided to implement a similar technique. However, instead of focusing on taste-related enjoyment words that have been used by previous researchers (e.g. Turnwald et al., 2019; Wansink et al., 2001, 2005), we decided to manipulate enjoyment by emphasizing the social experience of dining (i.e. the social frame) in the vegetarian food category name. Indeed, previous research showed that people generally associate socialization with positive affect and rank it among the most enjoyable activities (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004; White & Dolan, 2009). Moreover, in the context of food consumption, Andersson and Mossberg (2004) found that socialization is the most important aspect of people's dining experience. If socialization is therefore associated with enjoyment as these studies suggest, then a social frame of the vegetarian food category should activate the construct of enjoyable eating experience and as a result make people more likely to choose dishes belonging to this category.

In addition to a social frame, we tested a pro-environmental frame that emphasizes environmental benefits of vegetarian foods. Several articles from different domains indicate that this technique may effectively influence behavior and intentions. Verplanken and Holland (2002) showed that priming pro-environmental orientation (vs. control) made people put more weight on environmental attributes in a consumer choice. As a result, they selected an environmentally friendlier product. Similarly, in the domain of energy consumption, combining

electricity saving tips with environmental framing (vs. control) increased the intentions to save electricity and had a positive spillover on other climate-friendly intentions, unlike monetary framing which only influenced electricity-saving intentions but did not yield positive spillover effects (Steinhorst, Klöckner, & Matthies, 2015). Finally, regarding food choice, using a climate-friendly sticker alongside climate-friendly meals increased the purchases of these meals in a student canteen (Visschers & Siegrist, 2015). Overall, given that different interventions that emphasized environmental themes influenced intentions and behavior, it is plausible that using a pro-environmental frame for the "vegetarian" food category may make people feel more environmentally responsible and therefore increase their likelihood of vegetarian choice.

1.3. Overview of the Studies and Main Hypotheses

Overall, based on the previous research, we hypothesized that social and pro-environmental (vs. vegetarian) food category frames would increase vegetarian food choice. Moreover, we expected that the influence of the social frame would be mediated by enjoyable dining experience (e.g. Andersson & Mossberg, 2004; Kahneman et al., 2004), and the effect of the pro-environmental frame by feelings of environmental responsibility (e.g. Verplanken & Holland, 2002). To test the hypotheses, we conducted three large pre-registered online studies (see Appendix).[1] Study 1 consisted of three different menu conditions corresponding to the vegetarian, pro-environmental, and social frame. In Study 2, we added a neutral menu condition in which vegetarian and non-vegetarian dishes were mixed in the same category to understand how it influences food choices relative to the other three frames. Finally, in Study 3, we used only the neutral, vegetarian, and environmental menus to further clarify ambiguities regarding

[1] We confirm that all the three studies we conducted in the article were aligned with the Research Ethics Policy and Code of Research Conduct of the university at which the first author is employed.

the mechanism stemming from the first two studies, whereas the social frame was not used given that it produced clear findings regarding the mechanism. Given the number of different conditions and variables in the present research, in Table 1 we included a brief overview of all three studies. Data files for each study can be accessed via the Open Science Framework (https://osf.io/wv6p8/).

2. Study 1

In Study 1, we tested whether the social and pro-environmental (vs. vegetarian) frames would increase vegetarian food choice, and whether these effects would be mediated by enjoyable dining experience and pro-environmental responsibility respectively (Table 1). Mediation analysis has been criticized for several reasons; one of the most important ones is that researchers typically fail to minimize the possibility that some alternative mediators rather than the ones they hypothesized are in fact the "true" mediators that account for the main effects (e.g. Bullock, Green, & Ha, 2010). We undertook several measures to address this criticism. First, we assessed an additional alternative mediator—activation (i.e. being alert, aroused, etc.)—because this is a basic psychological process involved in action preparation that potentiates a variety of motivated behaviors, including food choice (e.g. Lang, Bradley, & Cuthbert, 1997; Lang, Greenwald, Bradley, & Hamm, 1993; Löw, Lang, Smith, & Bradley, 2008). Moreover, to probe mediation hypotheses, we tested all three mediators together in a parallel mediation model (Hayes, 2018), given that this model establishes which of the mediators produce largest mediated effects while accounting for correlations between them.

To show that our results are robust, we also tested several covariates. *Hunger* was measured because it can influence attitudes toward high calorie foods (relative to low calorie foods such as vegetables) and could therefore potentially influence people to select a non-

vegetarian option (Lozano, Crites, & Aikman, 1999). *Past behavior* (i.e. the extent to which people ate vegetarian during the previous week) was also used as a covariate because Bacon and Krpan (2018) showed that it can predict vegetarian choice. Moreover, we assessed *gender* given that meat is associated with masculinity and women are more likely to consume vegetarian foods than men (Rozin, Hormes, Faith, & Wansink, 2012; Ruby, 2012). Finally, we tested *age* because it may influence eating behavior (Drewnowski & Schultz, 2011) and probed *body mass index* (BMI) given that low BMI has been associated with vegetarians (Key, Appleby, & Rosell, 2006).

2.1. Method

2.1.1. Framing interventions

Overall, the following frames were employed in the present study: "Environmentally Friendly Main Courses for a Happy Planet" was used in the pro-environmental condition, "Refreshing Main Courses for Relaxing Conversations" in the social condition, and "Vegetarian Main Courses" in the vegetarian condition. The framing interventions used in the pro-environmental and social conditions were developed in a series of two pilots (see Supplementary Materials, pp. 3-4).

2.1.2. Stimuli: Restaurant menus

Food options were adopted from Bacon and Krpan (2018). In each condition, the menu had eight dishes (Figure 1). The two vegetarian dishes were always grouped together and placed in a separate menu section to which the framing manipulations were applied. Importantly, to ensure that, regardless of the menu frame, eaters understand which dishes are vegetarian, and any experimental effects on food choice therefore occur due to framing and not because participants failed to recognize vegetarian dishes, these dishes were marked with an asterisk in all menus, and a sign "Suitable for vegetarians" was included at the bottom right corner of each menu (e.g.

Figure 1). We created two menu versions for each framing condition (see an example in Figure 1), one in which the vegetarian dishes were on top (UP version) and one in which they were at the bottom (DOWN version)—a participant allocated to each condition could receive either of the two versions using random assignment. We did this because research showed that menu positions can influence food choices (Dayan & Bar-Hillel, 2011) and that people may process morality-related concepts differently when these are displayed up versus down (Meier, Sellbom, & Wygant, 2007). We therefore wanted to ensure that the effects of our interventions are not dependent on vegetarian dish locations. Menus used in all three conditions are available in the Supplementary Materials (pp. 5-8).

2.1.3. Participants, Design, and Procedure

One thousand eight hundred and two people (Males=978, Females=820, Other=3, Unidentified=1; M_{age}=37.5) living in the US completed the study. They were recruited via MTurk, and payment was $0.60. Sample size was determined using an a priori power analysis that is described in detail in the pre-registration document (Appendix). Participation on mobile phones was not allowed. We used a 3 (Menu Section Frame: Vegetarian vs. Pro-environmental vs. Social) x 2 (Menu Section Position: Up vs. Down) between-subjects design. Therefore, each person was randomly allocated to one of the three frames ("Vegetarian Main Courses" vs. "Environmentally Friendly Main Courses for a Happy Planet" vs. "Refreshing Main Courses for Relaxing Conversations") and received either an up or down version of the menu (for illustration, see Figure 1) using random assignment.

Participants first completed the consent form, after which they were asked to imagine a scenario in which it is an evening during the week and they are meeting a friend for dinner in a nice restaurant to catch up and have a good conversation (Bacon & Krpan, 2018). Then, on the

next page, they were shown a menu to which they have been allocated and asked to select a main course by clicking on it. Thereafter, they answered questions measuring mediators, covariates, and exploratory variables (see Section 2.1.4. below), and were thanked for participation and debriefed.

2.1.4. Measures

Dependent Variable and Mediators. The dependent variable (*vegetarian food choice*) assessed whether a participant selected either of the two vegetarian main courses, which was coded as a vegetarian choice (1), or one of the other six courses, which was coded as a non-vegetarian choice (0).

All mediators were measured on a scale from "1=not at all" to "5=extremely". For *environmental responsibility*, we asked participants to indicate to what extent the food category XXX (referring to one of the three vegetarian section frames) from the menu made them feel environmentally responsible. For *activation*, we asked them to indicate to what extent the food category XXX (referring to one of the three vegetarian section frames) from the menu made them feel activated (e.g. feeling alert, aroused, energized, or awake). Finally, *enjoyable dining experience* was measured using three items that were combined into a composite score (Cronbach's $\alpha = .94$). We asked participants to indicate to what extent they associate the food category XXX (referring to one of the three vegetarian section frames) from the menu with pleasure (1), enjoyment (2), and having a good time (3).

Covariates and Exploratory Variables. Hunger was assessed by asking participants how hungry they felt on a scale from "1=Not hungry at all" to "4=Very hungry". *Body mass index* (BMI) was assessed by asking them to report their weight and height and then computed via the formula by Frankel & Staeheli (1992). *Age* was measured by asking participants to report their

age in years. *Past behavior* was tested by asking them to report on how many days during the previous seven days they ate neither meat nor fish, on a scale from "No days=0" to "Every day=7" (Bacon & Krpan, 2018). Finally, we asked participants to identify their *gender* as male, female, or "other". For *exploratory variables*, see Supplementary Materials (p. 9).

Exclusion Criteria. The study involved several questions to identify participants who should be excluded from statistical analyses. We used three attention check items (e.g. "Please respond with 'Strongly Agree' for this item"), a seriousness check (Aust, Diedenhofen, Ullrich, & Musch, 2013), and participants were also asked to specify their dietary preferences (omnivore, pescatarian, vegetarian, vegan, or other). To be included in statistical analyses, participants had to pass all three attention check items as well as the seriousness check. Moreover, those who identified themselves as vegetarians or vegans were not included in the analyses because they were by default limited to the vegetarian section of the menu and were therefore not the target of our intervention.

2.2. *Results*

2.2.1. Excluded Data

Out of 1802 participants, 158 did not pass the checks, whereas additional 108 participants identified themselves as vegetarians or vegans, and their data were therefore excluded. Overall, 1536 participants were included in statistical analyses (522 in the vegetarian frame condition, 506 in the pro-environmental frame condition, and 508 in the social frame condition). We confirm that all the exclusions were consistent with the pre-registered exclusion criteria.

2.2.2. Influence of Menus on Food Choice

To test the hypothesized effects of menus on vegetarian choice, we computed a multiple logistic regression with two dummy variables as predictors, one for the pro-environmental frame

and one for the social frame. The vegetarian frame was therefore used as a comparison condition. As can be seen in Table 2, Model χ^2 was significant, thus showing that adding the two predictors to the model significantly improved the fit compared to the model with only the constant included. As hypothesized, the social (vs. vegetarian) frame made people roughly one and a half times more likely (odds ratio) to select a vegetarian option (Table 2). The second hypothesis was also supported, given that participants in the pro-environmental frame condition were almost twice as likely to select a vegetarian main course (odds ratio) compared to those in the vegetarian frame condition (Table 2). For the proportion of participants who made a vegetarian choice in each condition, see Figure 2.

To ensure robustness of these effects, we a) computed the same logistic regression that was used for main hypothesis testing with the covariates added as predictors, and b) probed whether the hypothesized effects were moderated by menu section position. The effects remained significant despite the covariates (Supplementary Materials, p. 11), and no interactions between the conditions and menu section position were detected (Supplementary Materials, p. 14), thus further establishing the robustness of the main findings.

2.2.3. Mediated Effects

To test the hypothesized mediated effects, we used a parallel mediation analysis computed using Process v3.3 for SPSS, model 4 (Hayes, 2018). Percentile-bootstrapping procedure with 10000 resamples was employed. Menu section frame was used as a categorical predictor, with the vegetarian frame being the reference category. All three mediators (environmental responsibility, enjoyable dining experience, and activation) were included in the model.

As hypothesized, the influence of the social (vs. vegetarian) frame on vegetarian food choice was mediated by enjoyable dining experience, whereas the other two mediators were not

significant (Figure 3). This mediated effect also stayed significant after we computed the same mediation analysis with covariates included, $a_2b_2 = 1.467$, 95% CI [1.290, 1.723]. In contrast, the other mediation hypothesis was not supported, given that the mediated effect of the pro-environmental frame on vegetarian food choice via environmental responsibility was not significant (Figure 3). In fact, contrary to expectations, the only significant mediated effect of the pro-environmental frame was through enjoyable dining experience. This effect remained significant after controlling for covariates, $a_5b_5 = 1.096$, 95% CI [1.020, 1.197].

2.3. Discussion

Study 1 supported the hypotheses regarding the impact of menu frames on food selection: both the social and the pro-environmental (vs. vegetarian) frames influenced vegetarian food choice. Mediation hypothesis regarding the social frame was also supported, given that enjoyable dining experience was the main mediator of the influence of this frame on the choice, in line with our theorizing (e.g. Andersson & Mossberg, 2004; White & Dolan, 2009). However, the mediation hypothesis regarding the pro-environmental frame was not supported given that the influence of this frame on vegetarian food choice was not mediated by environmental responsibility. Instead, the mediation analyses revealed that only enjoyable dining experience was a significant mediator. Considering that the first study both supported our hypotheses but also produced unexpected mediation results, in Study 2 we aimed to replicate the results of Study 1 but also gain further insights into the mediated effects.

3. Study 2

The present study again tested the hypothesized main effects of the social and pro-environmental (vs. vegetarian) frames on vegetarian food choice as well as the mediated effects via enjoyable dining experience and environmental responsibility (for summary, see Table 1).

We suspected that one reason why the predicted mediated effect of the pro-environmental frame on the food choice via environmental responsibility failed to occur in Study 1 may have been methodological. Namely, only enjoyable dining experience was assessed via three questions and may have thus been more sensitive than the other mediators that were measured via single items. Therefore, in Study 2, all mediators were measured via three items.

To gain further insights regarding the mechanism through which menu frames influence food choice, we tested an additional mediator: perceived segregation between vegetarians and other eaters. Research suggests that being a vegetarian does not indicate only food preferences but also signals the membership of a specific social group characterized by a vegetarian identity (e.g. Rosenfeld & Burrow, 2017). If that is indeed the case, then labelling a food category as "vegetarian" may send a message to all individuals who do not belong to this social group that the foods it contains are not aimed at them and thus reduce the likelihood of choice. In line with this rationale, it is plausible that the social and pro-environmental frames also increase vegetarian food choice because, compared to the vegetarian frame, they make people less likely to feel that the foods they contain are aimed only at eaters who identify themselves as vegetarians. We therefore hypothesized that, in addition to the main mediators (enjoyable dining experience and environmental responsibility), the perceived segregation would mediate the impact of both the social and pro-environmental frames on food choice.

In Study 2, we also tested an additional menu condition that aims to minimize perceived segregation between vegetarians and other eaters but without involving additional framing components: a neutral menu in which vegetarian and non-vegetarian foods are presented in the same section referred to as "Main Courses". In Bacon and Krpan (2018), a neutral menu increased vegetarian food choice compared to a menu with the vegetarian frame. However, their

finding was exploratory and was not robustly supported by all the analyses they conducted. Moreover, they did not identify potential mechanisms behind this finding. In the present study, we therefore aimed to test the impact of the neutral (vs. vegetarian) condition on vegetarian food choice more robustly, and we hypothesized that it would be mediated by the perceived segregation between vegetarians and other eaters.

Finally, we expected that the social and pro-environmental menus would each increase vegetarian food choice compared to the neutral menu because, even if all three menus do not segregate between vegetarians and other eaters, the first two menus have the additional framing manipulations embedded in them. In line with our initial theorizing, we hypothesized that the influence of the social and pro-environmental (vs. neutral) conditions on vegetarian food choice would be mediated by enjoyable dining experience and environmental responsibility respectively (e.g. Andersson & Mossberg, 2004; Verplanken & Holland, 2002).

3.1. Method

3.1.1. Stimuli: Restaurant menus

For the pro-environmental, social, and vegetarian frame conditions, the same menus as in Study 1 were used. The UP and DOWN versions of the neutral menu can be seen in Figure 4. They are the same as the menus for the other three conditions, except that all dishes are displayed in one section (“Main Courses”).

3.1.2. Participants, Design, and Procedure

Four thousand eight hundred thirty-two people (Males=2055, Females=2751, Other=25, Unidentified=1, M_{age}=38.0) living in the US completed the study via MTurk. Payment was again $0.60, and we did not allow completing the study via mobile phones. Sample size was determined a priori using the procedure detailed in the pre-registration document (Appendix).

We used a 4 (Menu Section Frame: Vegetarian vs. Pro-environmental vs. Social vs. Neutral) x 2 (Menu Section Position: Up vs. Down) between-subjects design. Each person was therefore randomly allocated to one of the four menu frames and received either an up or down version of the menu using random assignment. Procedure was the same as in Study 1, except that some new variables were measured (see Section 3.1.3. below).

3.1.3. Measures

Dependent variable, mediators, covariates, exclusion criteria, and exploratory variables. Dependent variable and exclusion criteria were the same as in Study 1. Moreover, the five covariates used in Study 1 were also used in Study 2, and one additional covariate was added—the extent to which participants thought that *vegetarian foods are environmentally friendly* (ranging from "1=Strongly disagree" to "7=Strongly agree"). This was one of the exploratory variables used in Study 1, but we decided to use it as a covariate in Study 2 because we found that it predicts vegetarian food choice. For exploratory variables, see Supplementary Materials (pp. 9-10).

Concerning mediators, they were all measured on a scale from "1 = not at all" to "5 = extremely". Enjoyable dining experience was probed as in Study 1 (Cronbach's $\alpha = .90$). Environmental responsibility was assessed using three items (Cronbach's $\alpha = .93$), by asking participants to what extent they associate the food category XXX (referring to one of the three vegetarian section frames or to "Main Courses" in case of the neutral menu) with acting for the benefit of the environment (1) and to what extent this category made them feel environmentally responsible (2) and environmentally friendly (3). Activation was also assessed using three items (Cronbach's $\alpha = .86$), by asking participants to what extent the food category made them feel aroused (1), energized (2), and excited (3). Finally, perceived segregation between vegetarians

(or vegans) and other eaters (Cronbach's $\alpha = .83$) was assessed by asking participants to indicate to what extent they feel that the vegetarian main courses were included on the menu only for a specific group of people (i.e. vegetarians or vegans) but not for other eaters (1), that these courses were aimed only at people who identify themselves as vegetarians (or vegans) but not at other restaurant guests (2), and that the menu created a segregation between vegetarians (or vegans) and other restaurant guests who do not belong to this group (3).

3.2. *Results*

3.2.1. Excluded Data

Out of 4832 participants, 287 did not pass the checks, whereas additional 244 participants identified themselves as vegetarians or vegans, and their data were therefore excluded. Overall, 4301 participants were included in statistical analyses (1073 in the vegetarian frame condition, 1081 in the pro-environmental frame condition, 1066 in the social frame condition, and 1081 in the neutral condition). We confirm that all the exclusions were consistent with the pre-registered exclusion criteria.

3.2.2. Influence of Menus on Food Choice

To test the hypotheses regarding the influence of the menu conditions on vegetarian choice, we computed two multiple logistic regressions, each with three dummy variables as predictors—in the first regression model, the vegetarian frame was the reference category, and in the second model the neutral menu was the reference (Table 3). Model χ^2 was significant for both regression models, thus showing that the predictors significantly improved the fit compared to the models with only the constant included (Table 3).

As can be seen in Table 3, the main findings were that the social, pro-environmental, and neutral menus all made people more likely to make a vegetarian selection (vs. the vegetarian

menu), in line with hypotheses. Moreover, as predicted, the pro-environmental frame (vs. neutral) increased vegetarian food choice. However, contrary to predictions, the social versus neutral conditions did not differ regarding vegetarian food choice. The proportion of participants who made a vegetarian choice in each of the four conditions can be seen in Figure 5.

To probe the robustness of the significant effects outlined above, we computed the same logistic regressions that were used for main hypothesis testing while adding the covariates as predictors, and we probed whether the effects were moderated by menu section position. The effects remained significant despite the covariates (Supplementary Materials, pp. 11-12), and no interactions between the conditions and menu section position were detected (Supplementary Materials, pp. 14-15), thus ensuring the robustness of the main findings.

3.2.3. Mediated Effects

Considering that mediation analyses are undertaken to probe the mechanism behind main effects and should not be employed in the absence of main effects (Yzerbyt, Muller, Batailler, & Judd, 2018), we did not probe the hypothesized mediated effect concerning the social versus neutral condition because the main effect did not occur. Mediation hypotheses were tested as in Study 1 (Hayes, 2018). Two analyses were conducted. In the first analysis, the vegetarian menu was the reference category, and in the second analysis the neutral menu was the reference. All four mediators (environmental responsibility, enjoyable dining experience, activation, and segregation) were included in the models.

As can be seen from Figure 6, the influence of the social (vs. vegetarian) frame on vegetarian food choice was mediated specifically by enjoyable dining experience and perceived segregation between vegetarians and other eaters, in line with hypotheses. These effects

remained significant after controlling for the covariates (a_2b_2 = 1.387, 95% CI [1.266, 1.536]; a_4b_4 = 1.250, 95% CI [1.183, 1.332]).

Concerning the influence of the pro-environmental (vs. vegetarian) frame on vegetarian food choice, the hypothesis regarding environmental responsibility was again not supported (Figure 6). However, as predicted, the segregation between vegetarians and other eaters was a significant mediator (Figure 6). As in Study 1, enjoyable dining experience was also a significant mediator, which was not predicted by our original hypothesizing (Figure 6). These mediated effects remained significant when controlling for the covariates (a_8b_8 = 1.086, 95% CI [1.045, 1.136]; a_6b_6 = 1.069, 95% CI [1.028, 1.118]).

Regarding the neutral (vs. vegetarian) condition, perceived segregation between vegetarians and other eaters was a significant mediator as hypothesized. However, the mediated effect of enjoyable dining experience was also significant and larger in magnitude, which we did not predict (Figure 6). Both effects remained stable after controlling for the covariates ($a_{12}b_{12}$ = 1.361, 95% CI [1.268, 1.473]; $a_{10}b_{10}$ = 1.696, 95% CI [1.471, 1.980]).

When it comes to the pro-environmental (vs. neutral) frame, we did not identify mediated effects that would explain the mechanism behind the main effect, and our hypothesis regarding environmental responsibility as a mediator was not supported (Figure 6). In fact, all the significant mediated effects were negative. Statistically speaking, significant mediated effects can occur even when the main effects are absent or can be in the opposite direction from the main effects, as in the present case (Hayes, 2018). However, on a conceptual level, mediated effects in those cases should be disregarded because they do not constitute an explanation of the main effects (e.g. Yzerbyt et al., 2018).

3.3. Discussion

Study 2 replicated the results from Study 1, given that both the social and the pro-environmental (vs. vegetarian) frames increased vegetarian food choice as hypothesized. Two hypotheses regarding main effects specific to Study 2 were also supported, considering that both the neutral (vs. vegetarian) and the pro-environmental (vs. neutral) menus positively impacted vegetarian food choice. However, Study 2 also showed that the social versus neutral conditions did not differ regarding vegetarian food choice, contrary to our prediction.

Concerning mediation hypotheses, the present study convincingly demonstrated the mechanism behind the influence of the social (vs. vegetarian) frame on food choice. Indeed, as hypothesized, both enjoyable dining experience and perceived segregation between vegetarians (or vegans) and other eaters were significant as mediators, and they explained a large proportion of the main effect. In contrast, the mediated effects regarding the pro-environmental frame did not constitute a convincing demonstration of the mechanism because they explained only a minor proportion of the main effect. As in Study 1, environmental responsibility was again not significant as a mediator whereas the mediated effect of enjoyable dining experience was significant. Moreover, the segregation variable produced a significant mediated effect as predicted.

Regarding the neutral (vs. vegetarian) menu, the mediated effects explained a substantial proportion of the main effect. As hypothesized, the perceived segregation was significant as a mediator. However, the mediated effect of enjoyable dining experience was also significant and larger in magnitude than the mediated effect of the segregation variable, which we did not predict. However, this may have been a methodological artefact. Namely, to measure the mediator in the neutral condition, we asked participants to what extent they associated the food category “Main Courses” with pleasure, enjoyable dining experience, and having a good time.

Because both vegetarian and non-vegetarian items were mixed in this menu section, participants' enjoyable dining experience ratings may have been inflated by the presence of the non-vegetarian options, which may have produced an inflated mediated effect.

Finally, concerning the pro-environmental (vs. neutral) menu, the prediction regarding environmental responsibility as a mediator was not supported, and no reliable mediated effects were detected. Overall, considering that Study 2 did not produce clear findings regarding the mechanism behind the influence of the pro-environmental and neutral conditions on vegetarian food choice, we aimed to further clarify these mechanisms in the next study.

4. Study 3

Because the results regarding the social framing were clear cut, in Study 3 we omitted this condition to allow for a larger sample size to further probe the effects that were not as straightforward in the previous studies. More specifically, the aim of the present study was to clarify the mediated effects of the pro-environmental and neutral menus on the food choice (for study overview, see Table 1). Concerning the neutral (vs. vegetarian) condition, Study 2 showed that its influence was mediated by perceived segregation between vegetarians and other eaters as predicted. However, we did not expect that the mediated influence via enjoyable dining experience would be larger in magnitude. We speculated that this may have occurred because most items assessing the mediators were phrased in reference to menu section names, which may have inflated the enjoyment ratings in the neutral condition given that the vegetarian and meat/fish dishes were displayed in the same section. In Study 3, we therefore phrased all the mediators that previously referred to menu section names in relation to the corresponding vegetarian courses (this does not apply to the perceived segregation variable because it was measured in reference to the overall menu). For example, rather than answering to what extent

participants associated a menu section with enjoyable dining experience, they would answer this question regarding each of the two vegetarian items, and the average score across the items would then be used as a mediator.

This approach also allowed us to further clarify the mediated effects behind the influence of the pro-environmental (vs. vegetarian or neutral) frame on vegetarian food choice. Across both previous experiments, the prediction that environmental responsibility would mediate this influence on the food choice was not supported, and unexpected mediated effects (i.e. via enjoyable dining experience) also occurred. Phrasing the mediation items in relation to specific vegetarian dishes would allow us to eliminate the possibility that the hypothesized mediated effects failed to occur because the mediator variables were not measured with enough precision. Another possibility is that pro-environmental responsibility was not supported as a mediator because some other variables linked to the environment rather than this variable are in fact true mediators. Therefore, in Study 3 we assessed additional three variables that research typically links to pro-environmental behavior: locus of control (i.e. the extent to which participants think they can make a change through their behavior; Kollmuss & Agyeman, 2002), environmental concern (i.e. the extent to which they feel concerned about environmental issues; Eom, Kim, Sherman, & Ishii, 2016; Tam & Chan, 2017), and anticipated guilt (i.e. the extent to which they anticipate feeling guilty if they fail to act pro-environmentally; Onwezen, Antonides, & Bartels, 2013). We tested these variables to probe whether the mediation predictions we had regarding environmental responsibility apply to the alternative mediators instead.

4.1. Method

4.1.1. Participants, Design, Stimuli, and Procedure

Five thousand eight hundred and thirty people (Males=2371, Females=3437, Other=21, Unidentified=1, M_{age}=37.7) living in the US completed the study via MTurk. Payment was again $0.60, and we did not allow completing the study via mobile phones. Sample size was determined a priori via power analyses described in the preregistration document (Appendix). We used a 3 (Menu Section Frame: Vegetarian vs. Pro-environmental vs. Neutral) x 2 (Menu Section Position: Up vs. Down) between-subjects design. The same menus as in Study 2 were used in each condition, and the procedure was similar. One of the differences was that we changed how the mediators were measured (all except for "perceived segregation between vegetarians and other eaters"). Namely, after making their dish selections, all participants were again shown the same menu and asked to click on "Risotto Primavera", after which they answered the mediation questions pertaining to the dish (see Section 4.1.2. below). The same procedure was repeated for "Ricotta and Spinach Ravioli". The order in which the two dishes were probed was randomized across participants. Other changes relative to the procedure from Study 2 were that we added an additional exclusion criterion, and we did not measure any exploratory variables (see Section 4.1.2. below).

4.1.2. Measures

Dependent variable, Mediators, Covariates, and Exclusion Criteria. Dependent variable and the covariates were the same as in Study 2. We also used the same exclusion criteria, except that we added a *Captcha verification question* at the end of the study that all participants had to answer to show that they are not bots and receive their MTurk validation code. All mediators were measured on a scale from "1 = not at all" to "5 = extremely". *Perceived segregation between vegetarians (or vegans) and other eaters* was measured using the same items as in Study 2 (Cronbach's α = .86). *Environmental responsibility* (Cronbach's α = .94), *enjoyable*

dining experience (Cronbach's α = .90), and *activation* (Cronbach's α = .87) were also measured using the same items as in the previous study, except that now each item was assessed specifically in reference to each of the two vegetarian dishes from the menus (e.g. "To what extent does this dish make you feel environmentally friendly?"), and all items were then combined into the corresponding composite scores. *Locus of control* (Cronbach's α = .86) was measured by asking participants to what extent each of the vegetarian dishes on the menu made them feel that their actions can create a change and help resolve the current environmental problems our world is facing (Kollmuss & Agyeman, 2002). *Environmental concern* (Cronbach's α = .82) was measured by asking participants to what extent each of the vegetarian dishes made them feel concerned about the situation of the environment in general (Landry, Gifford, Milfont, Weeks, & Arnocky, 2018). Finally, *anticipated guilt* (Cronbach's α = .82) was measured by asking participants to what extent not ordering each of the two vegetarian dishes would make them feel guilty for acting in a way that negatively impacts the environment (Onwezen et al., 2013).

4.2. *Results*

4.2.1. Excluded Data

Out of 5830 participants, 286 did not pass the checks, whereas additional 245 participants identified themselves as vegetarians or vegans, and their data were excluded. Therefore, 5229 participants were included in statistical analyses (1752 in the vegetarian frame condition, 1741 in the pro-environmental frame condition, and 1736 in the neutral condition). We confirm that all the exclusions were consistent with the pre-registered exclusion criteria.

4.2.2. Influence of Menus on Food Choice

To test the hypotheses regarding the influence of the menu conditions on vegetarian choice, we computed two multiple logistic regressions, each with two dummy variables as predictors—in the first regression model, the vegetarian frame was the reference category, and in the second model the neutral menu was the reference (Table 4). Model χ^2 was significant for both regression models, thus showing that the predictors significantly improved the fit compared to the models with only the constant included (Table 4). As Table 4 shows, the pro-environmental frame and the neutral menu made people more likely to choose a vegetarian dish compared to the vegetarian menu in line with hypotheses. However, the hypothesized effect regarding the impact of the pro-environmental versus neutral conditions on vegetarian food choice was not replicated, given that the two conditions did not significantly differ. The proportion of participants who made a vegetarian choice in each condition can be seen in Figure 7.

To probe the robustness of the significant main effects, we computed the same logistic regressions that were used for main hypothesis testing while adding the covariates as predictors, and we probed whether the effects were moderated by menu section position. The effects remained significant despite the covariates (Supplementary Materials, pp. 12-13), and no interactions between the conditions and menu section position were detected (Supplementary Materials, pp. 15-16), thus ensuring the robustness of the main findings.

4.2.3. Mediated Effects

Considering that mediation analyses are undertaken to probe the mechanism behind main effects and should not be employed in the absence of these effects (Yzerbyt et al., 2018), we did not probe the hypothesized mediated effect concerning the impact of the pro-environmental (vs. neutral) condition on vegetarian food choice because the main effect did not occur. Mediation

hypotheses were tested as in Studies 1 and 2 (Hayes, 2018). One mediation model with two dummy variables was computed (vegetarian menu frame was the reference category), and all seven mediators were included (environmental responsibility, enjoyable dining experience, activation, segregation, locus, environmental concern, and anticipated guilt).

Concerning the influence of the pro-environmental (vs. vegetarian) frame on vegetarian food choice, none of the four variables linked to the environment (environmental responsibility, locus, environmental concern, and anticipated guilt) were significant as mediators, contrary to our predictions (Figure 8). In contrast, perceived segregation between vegetarians and other eaters was a significant mediator as hypothesized, thus replicating the result of the previous study (Figure 8). This effect remained significant when controlling for the covariates (a_4b_4 = 1.064, 95% CI [1.033, 1.100]).

Regarding the neutral (vs. vegetarian) condition, our prediction regarding the segregation variable was supported, given that it yielded a significant mediated effect largest in magnitude (Figure 8). Finally, the mediated effect via enjoyable dining experience was also significant but smaller in size than the mediated effect via the segregation variable. Both effects remained stable after controlling for the covariates ($a_{11}b_{11}$ = 1.280, 95% CI [1.211, 1.363]; a_9b_9 = 1.193, 95% CI [1.130, 1.266]).

4.3. *Discussion*

Study 3 replicated some of the results from Study 2, given that both the pro-environmental and neutral (vs. vegetarian) frames increased vegetarian food choice as expected. In contrast to Study 2, the hypothesis regarding the pro-environmental (vs. neutral) condition was not supported, given that the main effect on vegetarian food choice failed to occur. Concerning the mediation predictions, the present study clarified the mediated effects of the neutral (vs.

vegetarian) condition on vegetarian dish selections. Perceived segregation between vegetarians (or vegans) and other eaters was the main mediator as predicted. A mediated effect via enjoyable dining experience was also significant, although this effect was now smaller than in Study 2 where the variable was measured in relation to the menu section name (Main Courses) rather than in relation to the two vegetarian dishes themselves. Importantly, these two mediators explained almost the entire main effect of the neutral (vs. vegetarian) condition on the food choice. Concerning the pro-environmental (vs. vegetarian) condition, the hypothesized mediated effect via the perceived segregation between vegetarians and other eaters was significant but explained only a minor proportion of the main effect, whereas no other mediated effects occurred.

5. General Discussion

Overall, the present article went beyond previous research on framing and food choice by probing whether reframing the name of the vegetarian food category can influence choices of vegetarian dishes without reframing the names of the dishes themselves. Moreover, whereas previous research typically focused on frames that emphasized taste or sensory aspects of enjoyable eating (e.g. Turnwald et al., 2019; Wansink et al., 2001, 2005), we examined frames that, to our knowledge, were not previously investigated. More specifically, we developed a frame that emphasized the social context of dining as an aspect of enjoyable eating experience (e.g. Andersson & Mossberg, 2004; Kahneman et al., 2004), and a frame that made the environmental benefits of vegetarian foods salient (e.g. Verplanken & Holland, 2002). In addition, we tested a neutral menu in which the vegetarian and non-vegetarian foods were presented under the same frame “Main Courses” (Bacon & Krpan, 2018). A consistent finding that emerged across all studies is that the social, pro-environmental, and neutral conditions all

increased vegetarian food choice compared to the vegetarian frame, whereas no consistent differences occurred among the three conditions.[2] The main message of the present research is therefore that the absence of vegetarian framing, regardless of the alternative intervention, may make vegetarian choices more likely.

5.1. Psychological Mechanism Behind the Influence of Frames on Vegetarian Choice

An important contribution of our studies to the previous literature is that we comprehensively investigated the psychological mechanism behind the main effects. Apart from one exception (Turnwald et al., 2019), studies that tackled the effects of framing on food choice generally failed to consider the mechanism in depth. Concerning the influence of the social (vs. vegetarian) frame on vegetarian food choice, the mechanism was straightforward. The main mediator of this influence was enjoyable dining experience, in line with previous research which indicated that socialization is linked to eating enjoyment and pleasure more generally (e.g. Andersson & Mossberg, 2004; Kahneman et al., 2004). Moreover, an additional mediator we identified was perceived segregation between vegetarians (or vegans) and other eaters, in line with predictions (e.g. Rosenfeld & Burrow, 2017). Together, these two mediators explained a large proportion of the influence of the social (vs. vegetarian) frame on food choice.

Concerning the impact of the neutral (vs. vegetarian) condition on vegetarian food choice, we also identified a clear-cut mechanism. As predicted (e.g. Rosenfeld & Burrow, 2017), this

[2] Exploratory analyses for Studies 2 and 3 (see Supplementary Materials, pp. 17-19) suggest that, although the pro-environmental (vs. vegetarian) frame did not consistently influence food choice, this influence may be moderated by the extent to which participants perceive vegetarian foods as environmentally friendly. Indeed, the pro-environmental (vs. neutral) frame increased vegetarian food choice for participants who saw vegetarian dishes as environmentally friendly, whereas it reversed for participants at the opposite side of the spectrum. Although this is an exploratory finding that was not pre-registered and should therefore be taken with caution, we mention it here to inform researchers who may be interested in studying similar topics in the future.

influence was mediated by perceived segregation between vegetarians and other eaters. We also identified another mediator that we did not predict in advance—enjoyable dining experience. Together, these two mediators explained a large proportion of the main effect. By clarifying the mechanism behind the impact of the neutral (vs. vegetarian) condition on food choice, we extend the findings by Bacon and Krpan (2018) who only explored the main effect but did not establish the mechanism.

Regarding the influence of the pro-environmental (vs. vegetarian) frame on the vegetarian choice, the main conclusion is that we did not identify a convincing mechanism. Out of all the mediators tested, the only significant mediator that replicated across the studies in which we used it (2 and 3) was the segregation variable, as hypothesized (e.g. Rosenfeld & Burrow, 2017). However, this mediated effect was relatively small and explained only a minor proportion of the main effect of the pro-environmental (vs. vegetarian) frame on food choice.

Overall, the present research uncovered two mechanisms that together explained a large proportion of the effects of the social and neutral (vs. vegetarian) conditions on vegetarian food choice—enjoyable dining experience and the segregation between vegetarians and other eaters. No such convincing mediator effects emerged for the pro-environmental condition. It is important to discuss this overarching pattern of findings in the context of other relevant research, such as studies by Turnwald et al. (2019), who investigated the mechanism behind the influence of dish framing on vegetarian choice, and research on dynamic norms (e.g. Sparkman & Walton, 2017). Although dynamic norms do not involve reframing dish or food category names, which is a technique at the core of the present article, they are one of the few behavioral intervention techniques in relation to which the mechanism behind the influence on vegetarian food choice has been comprehensively tested. Overall, this research showed that influencing vegetarian

choice is driven by increased expectations of a positive taste experience (Turnwald et al., 2019), and by the beliefs that meat consumption will decrease in the future and that reducing meat consumption matters to other people (Sparkman & Walton, 2017). Whereas enjoyable dining experience that we established as a mechanism is conceptually similar to one of the previously identified mechanisms (i.e. expectations of a positive taste experience), perceived segregation between vegetarians and other eaters is a novel mechanism that to our knowledge has not been previously identified. Therefore, researchers should consider this variable, alongside the other already established mechanisms, when testing the impact of various behavioral interventions on vegetarian food choice.

Finally, it is important to point out that, in contrast to previous findings and speculations in the domain of sustainability (e.g. Elgaaied, 2012; Eom et al., 2016; Verplanken & Holland, 2002), our research indicates that interventions that emphasize sustainability (i.e. pro-environmental frame) do not necessarily change food-related behavior via feelings of environmental responsibility or concern. The exact mechanism in this regard will therefore need to be clarified in future studies.

5.2. Limitations

To understand the value of the present research, it is also necessary to consider its limitations. One limitation concerns the ecological validity, considering that our studies were conducted online rather than in an actual restaurant. To minimize this weakness and make the food choice seem more realistic, we instructed all participants to imagine a concrete restaurant scenario (see Bacon & Krpan, 2018). Given that a few other influential studies that tackled a similar topic were also conducted online (e.g. Bacon & Krpan, 2018; Liu, Roberto, Liu, & Brownell, 2012), previous research indicates that this mode of experimentation also has certain

benefits, such as probing the psychological mechanism behind the main effects in depth (e.g. Turnwald et al., 2019). However, in online studies, participants are aware that their responses are being monitored and that they will not actually pay for or eat their selected dish, which could result in different choices than in an actual restaurant. Therefore, our aim for the future studies is to investigate whether the interventions that we convincingly replicated in the present research are equally robust in a more naturalistic setting.

Another limitation concerns the generalizability of the findings. Considering the current replication crisis in psychology (Shrout & Rodgers, 2018), in the present research we decided to focus on a relatively narrow set of frames and dishes, and to consistently replicate the results across several pre-registered studies with large samples to ensure that they are not false-positives. To address the low generalizability of our findings stemming from this approach, we conducted an additional study that is reported in the Supplementary Materials (pp. 20-27). In this study, we focused on two different vegetarian courses ("Three Bean Tacos" and "Beyond Meat Burger") that may be more representative of vegetarian dishes than the courses that we used in Studies 1-3 (e.g. pasta) because they contain ingredients that are typically classified as meat substitutes (i.e. beans and plant-based meat alternatives; see Harwatt, Sabaté, Eshel, Soret, & Ripple, 2017; van der Weele, Feindt, van der Goot, van Mierlo, & van Boekel, 2019). We adopted the design of Study 3 and focused specifically on the pro-environmental (vs. vegetarian) condition as the most representative frame in the present research, and on the following four representative mediator variables: environmental responsibility, enjoyable dining experience, activation, and segregation between vegetarians and other eaters.

The findings of the study were consistent with our previous studies. Pro-environmental (vs. vegetarian) frame increased vegetarian food choice, and the effect size was similar to Studies

1-3 (odds ratio = 1.633). Moreover, as in the previous studies, a convincing mechanism was not identified, and this time none of the four mediators were significant. Whereas this study does not fully resolve the issue of generalizability of the present research, it does indicate that the effects of our interventions may apply to a range of vegetarian dishes, including those that contain ingredients more typically classified as meat substitutes (Harwatt et al., 2017; van der Weele et al., 2019). Also, this study confirms our previous conclusion that, in contrast to findings and speculations by previous researchers (e.g. Verplanken & Holland, 2002), interventions that emphasize sustainability may impact food choice via mechanisms that do not necessarily involve feelings of environmental responsibility, which will need to be clarified in future research.

5.3. Conclusion

Overall, our research shows that people are more likely to order vegetarian dishes when this food category is labelled with names that emphasize its environmental benefits or the social experience of dining, or when vegetarian and non-vegetarian dishes are presented under the same menu section. These findings are likely to be robust because they were established in three large pre-registered studies and indicate the potential of techniques stemming from psychology to increase sustainable food consumption and deepen its theoretical understanding.

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Table 1

Brief Overview of The Present Research

Study	Participants: Recruited vs. Included	Conditions	Outcome Variables	Main Findings
1	1802 vs. 1536	(1) Vegetarian vs. (2) Social vs. (3) Pro-environmental Frame	**DV:** Vegetarian Food Choice **Mediators:** (1) Environmental Responsibility, (2) Enjoyable Dining Experience, (3) Activation (i.e. Feeling Energized, Aroused, etc.).	Social (vs. Vegetarian) frame increased Vegetarian Food Choice. This influence was mediated by mediator (2). Pro-environmental (vs. Vegetarian) frame increased Vegetarian Food Choice. This influence was mediated by mediator (2).
2	4832 vs. 4301	(1) Vegetarian vs. (2) Social vs. (3) Pro-environmental vs. (4) Neutral Frame	**DV:** Vegetarian Food Choice **Mediators:** (1) Environmental Responsibility, (2) Enjoyable Dining Experience, (3) Activation (i.e. Feeling Energized, Aroused, etc.), (4) Perceived Segregation between Vegetarians and Other Eaters.	Social (vs. Vegetarian) frame increased Vegetarian Food Choice. This influence was mediated by mediators (2) and (4). Pro-environmental (vs. Vegetarian) frame increased Vegetarian Food Choice. This influence was mediated by mediators (2) and (4). Neutral (vs. Vegetarian) frame increased Vegetarian Food Choice. This influence was mediated by mediators (2) and (4). Pro-environmental (vs. Neutral) frame increased Vegetarian Food Choice.
3	5830 vs. 5229	(1) Vegetarian vs. (2) Pro-environmental vs. (3) Neutral Frame	**DV:** Vegetarian Food Choice **Mediators:** (1) Environmental Responsibility, (2) Enjoyable Dining Experience, (3) Activation (i.e. Feeling Energized, Aroused, etc.), (4) Perceived Segregation between Vegetarians and Other Eaters,	Pro-environmental (vs. Vegetarian) frame increased Vegetarian Food Choice. This influence was mediated by mediator (4). Neutral (vs. Vegetarian) frame increased Vegetarian Food Choice. This influence was mediated by mediators (2) and (4).

	(5) Locus of Control, (6) Environmental Concern, (7) Anticipated Guilt.

Note: Numbers that precede *Conditions* and *Outcome Variables* were included for the sake of clarity; they do not refer to numbers used in statistical analyses. Mediator numbers in the column *Outcome Variables* correspond to mediator numbers in the column *Main Findings.* Abbreviation DV in the *Outcome Variables* column refers to the dependent variable. Details regarding mediated effects in Studies 1-3 that are reported in the column *Main Findings* can be seen in Figs. 3, 6 and 8 respectively.

Table 2

Logistic Regression for the Influence of Pro-environmental and Social Menu Frames (vs. Vegetarian) on Vegetarian Food Choice in Study 1

Predictor	B (log odds)	*SE* B	Wald	Exp (B) (odds ratio)	95% CI for Exp (B)	p-value
Constant	−1.916	0.131	214.303	0.147	-	< .001
Social	0.446	0.173	6.616	1.562	[1.112, 2.194]	.010
Pro-environmental	0.658	0.169	15.133	1.930	[1.386, 2.689]	< .001

Note: Model R^2 = 0.017 (Nagelkerke), Model χ^2 (2) = 15.955, $p < .001$
Vegetarian menu is the reference category.

Table 3

Logistic Regression Models for the Influence of Menu Section Frame Conditions on Vegetarian Food Choice in Study 2

Model 1						
Predictor	**B (log odds)**	***SE* B**	**Wald**	**Exp (B) (odds ratio)**	**95% CI for Exp (B)**	**p-value**
Constant	−1.649	0.083	394.625	0.192	-	< .001
Social	0.381	0.111	11.713	1.463	[1.177, 1.819]	.001
Pro-environmental	0.593	0.108	30.018	1.810	[1.464, 2.238]	< .001
Neutral	0.363	0.111	10.657	1.437	[1.156, 1.787]	.001

Note: Model R^2 = 0.011 (Nagelkerke), Model χ^2 (3) = 31.160, p < .001
Vegetarian menu is the reference category.

Model 2						
Predictor	**B (log odds)**	***SE* B**	**Wald**	**Exp (B) (odds ratio)**	**95% CI for Exp (B)**	**p-value**
Constant	−1.286	0.074	303.397	0.276	-	< .001
Social	0.018	0.105	0.029	1.018	[0.829, 1.250]	.864
Pro-environmental	0.230	0.101	5.165	1.259	[1.032, 1.536]	.023
Vegetarian	−0.363	0.111	10.657	0.696	[0.560, 0.865]	.001

Note: Model R^2 = 0.011 (Nagelkerke), Model χ^2 (3) = 31.160, p < .001
Neutral menu is the reference category.

Table 4

Logistic Regression Models for the Influence of Menu Section Frame Conditions on Vegetarian Food Choice in Study 3

Model 1						
Predictor	**B (log odds)**	***SE* B**	**Wald**	**Exp (B) (odds ratio)**	**95% CI for Exp (B)**	**p-value**
Constant	−1.514	0.062	593.591	0.220	-	< .001
Pro-environmental	0.390	0.083	21.822	1.477	[1.254, 1.739]	< .001
Neutral	0.375	0.084	20.090	1.455	[1.235, 1.714]	< .001

Note: Model R^2 = 0.008 (Nagelkerke), Model χ^2 (2) = 27.916, p < .001
Vegetarian menu is the reference category.

Model 2						
Predictor	**B (log odds)**	***SE* B**	**Wald**	**Exp (B) (odds ratio)**	**95% CI for Exp (B)**	**p-value**
Constant	−1.139	0.056	413.689	0.320	-	< .001
Pro-environmental	0.015	0.079	0.036	1.015	[0.869, 1.185]	.850
Vegetarian	−0.375	0.084	20.090	0.687	[0.583, 0.810]	<.001

Note: Model R^2 = 0.008 (Nagelkerke), Model χ^2 (2) = 27.916, p < .001
Neutral menu is the reference category.

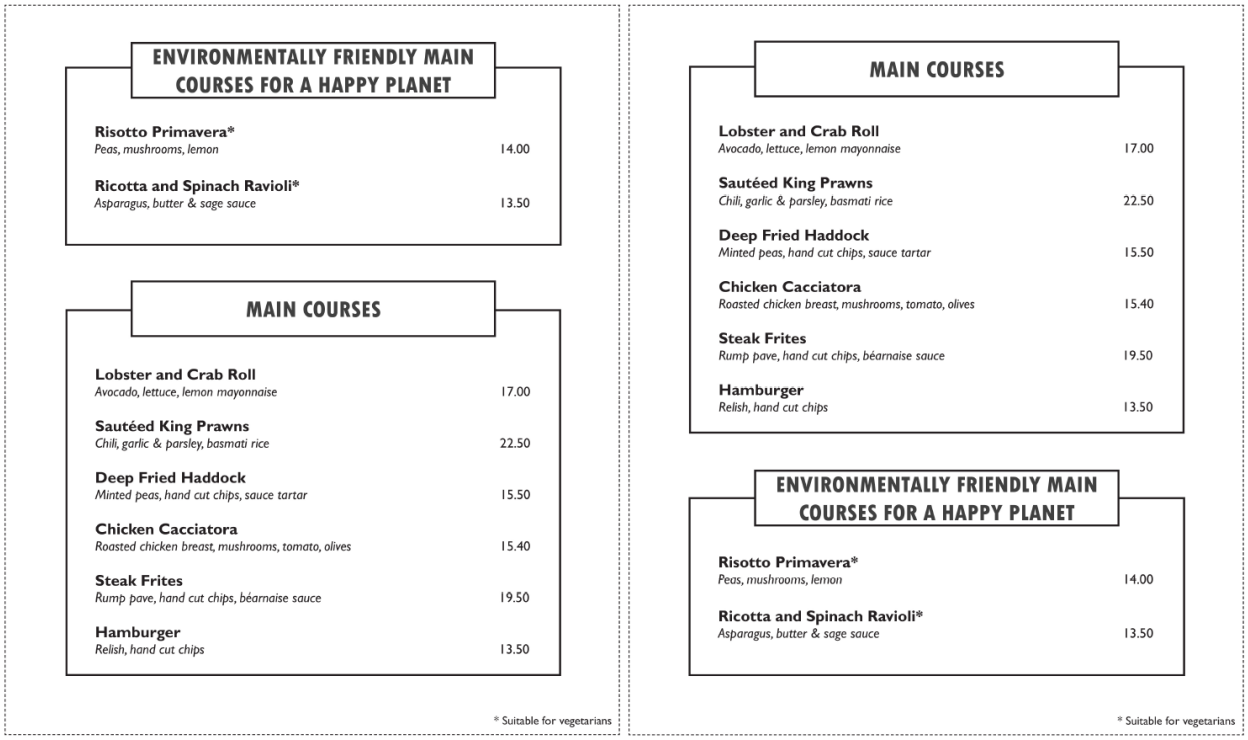


Figure 1. Two different versions—UP (left) and DOWN (right)—of the menus that were used in the pro-environmental frame condition (Studies 1, 2, and 3).

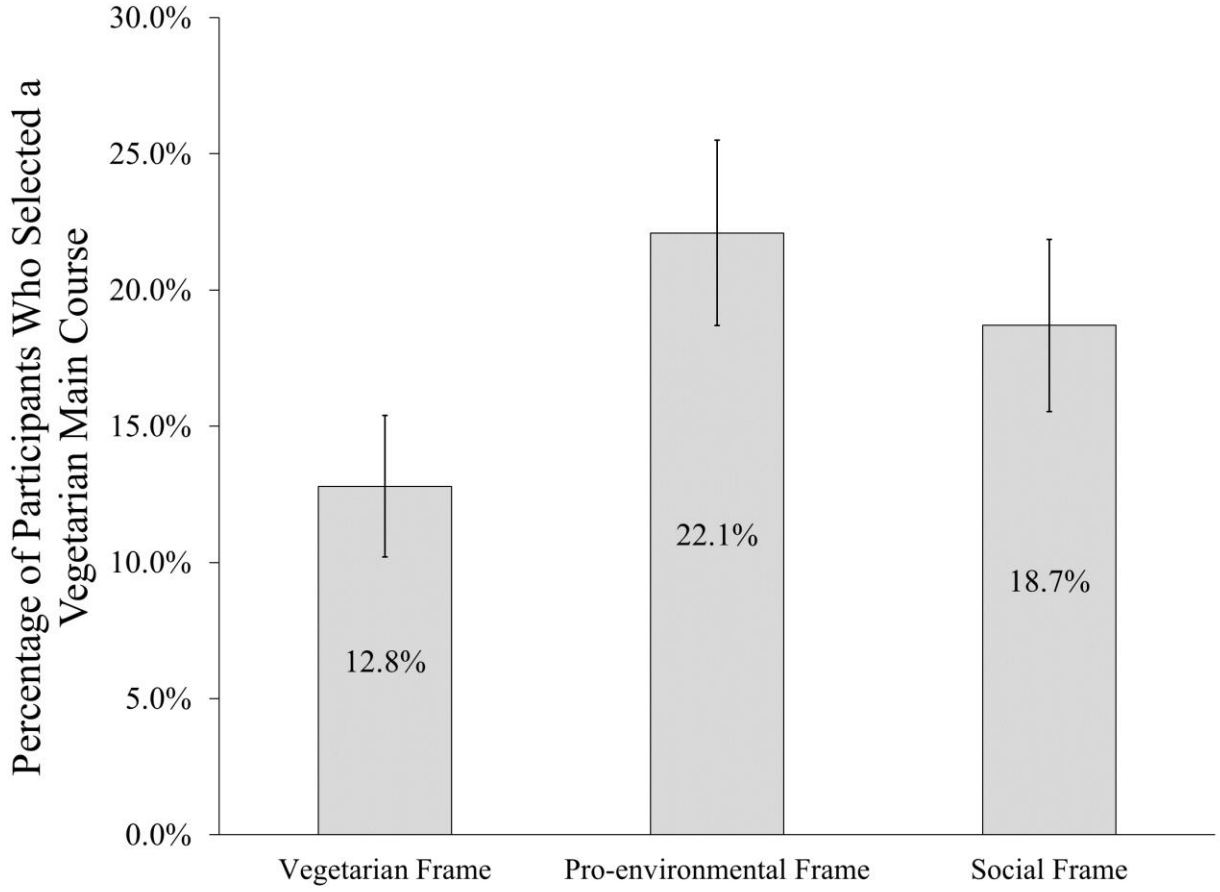


Figure 2. Percentage of participants who made a vegetarian choice in each condition in Study 1. Error bars correspond to the 95% CI calculated using Wilson's (1927) method.

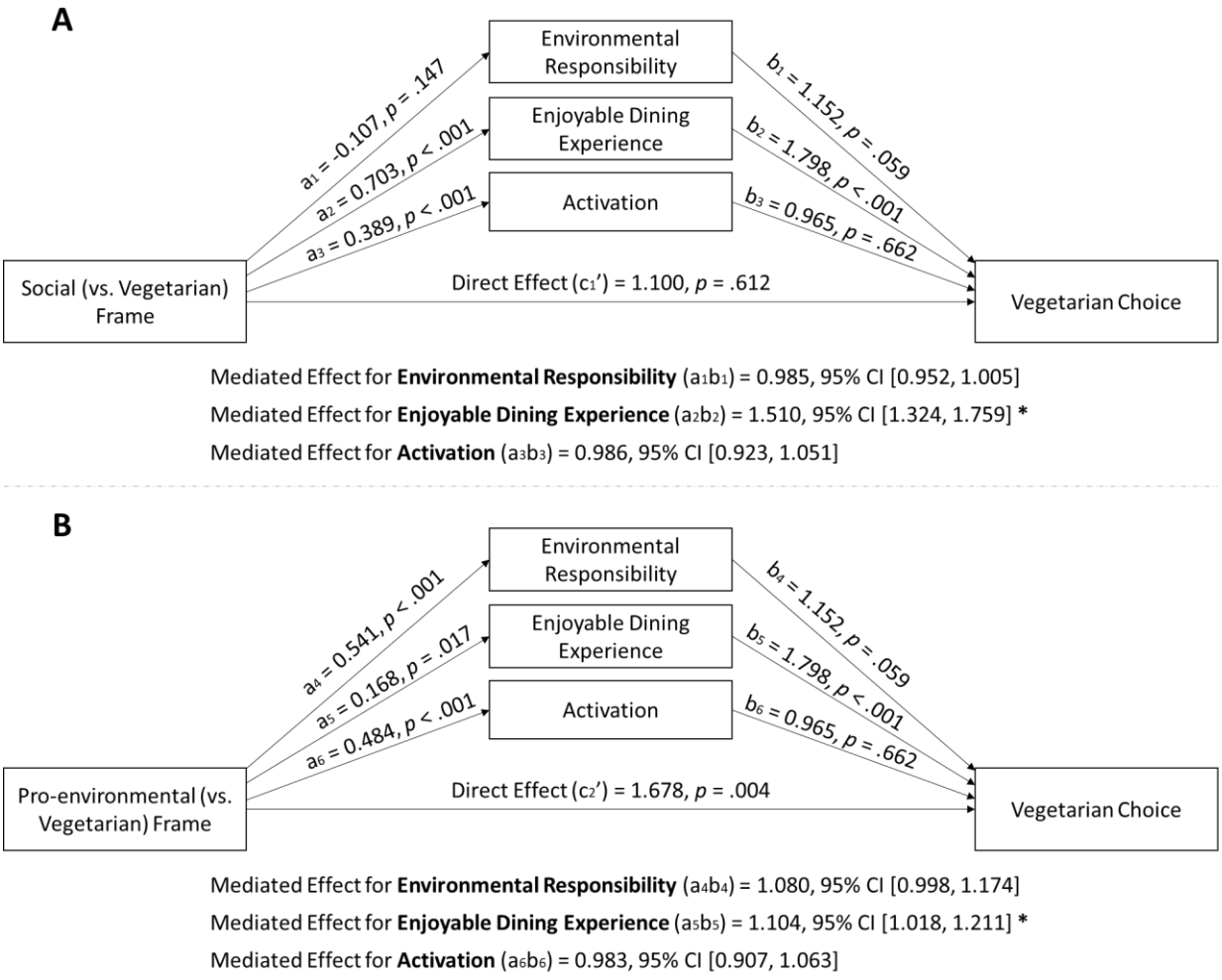


Figure 3. Mediated effects of the social (vs. vegetarian) frame (Panel A) and the pro-environmental (vs. vegetarian) frame (Panel B) on vegetarian food choice. Although both frames were tested in the same parallel mediation model, we present them in separate panels for the sake of clarity. Coefficients labelled with "a" indicate the influence of the pro-environmental or social (vs. vegetarian) frames on each of the three mediators, whereas coefficients labelled with "b" indicate the relationship between a mediator and vegetarian choice (expressed in odds ratios). All direct and mediated effects are expressed in odds ratios. Significant mediated effects (at $\alpha = .05$) are those whose 95% CIs do not include 1; all significant mediated effects are labelled with * for clarity. All coefficients that are expressed in odds ratios were in log odds

units in the original analysis output but were transformed into odds ratios for a more intuitive understanding of the effects.

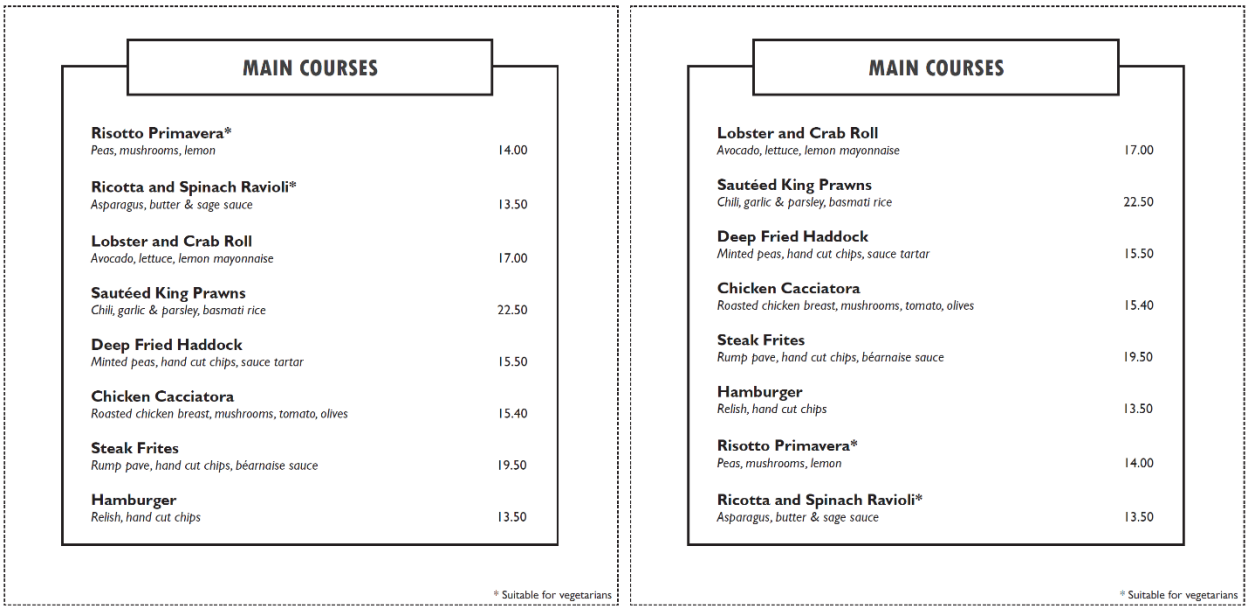


Figure 4. Two different versions—UP (left) and DOWN (right)—of the menus that were used in the neutral condition (Studies 2 and 3).

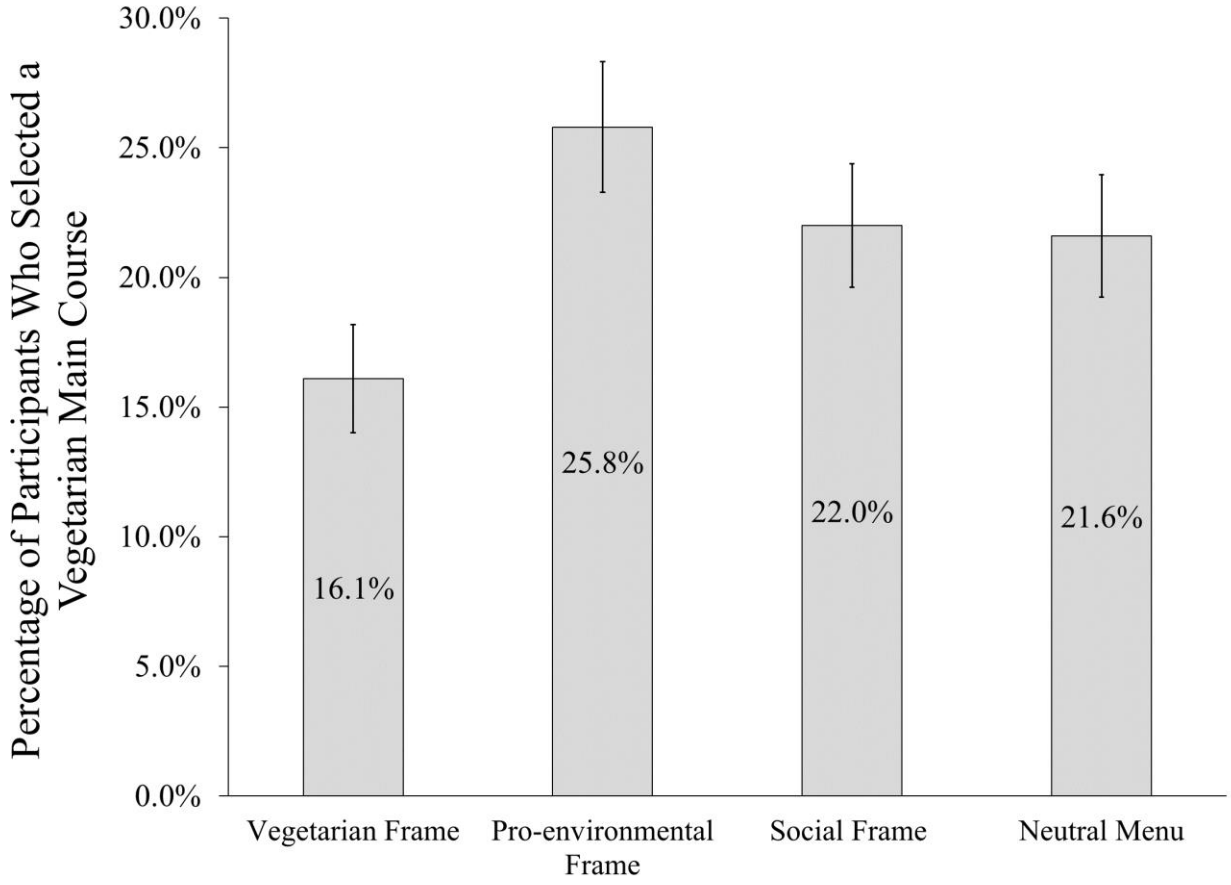


Figure 5. Percentage of participants who made a vegetarian choice in each condition in Study 2. Error bars correspond to the 95% CI calculated using Wilson's (1927) method.

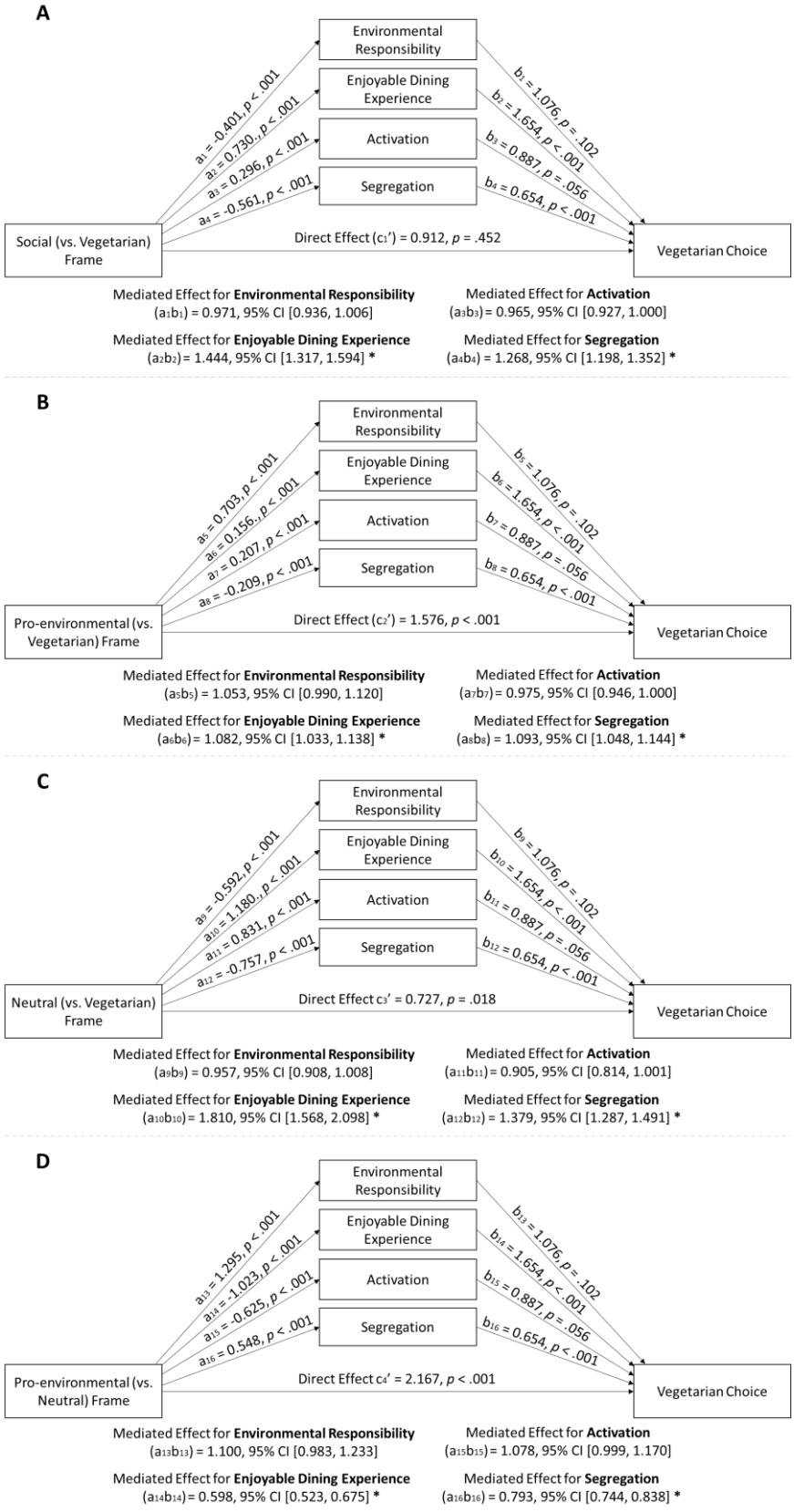

A
Environmental Responsibility
Enjoyable Dining Experience
Activation
Segregation
Social (vs. Vegetarian) Frame
Vegetarian Choice
a1 = -0.401, p < .001
a2 = 0.730., p < .001
a3 = 0.296, p < .001
a4 = -0.561, p < .001
b1 = 1.076, p = .102
b2 = 1.654, p < .001
b3 = 0.887, p = .056
b4 = 0.654, p < .001
Direct Effect (c1′) = 0.912, p = .452
Mediated Effect for Environmental Responsibility (a1b1) = 0.971, 95% CI [0.936, 1.006]
Mediated Effect for Activation (a3b3) = 0.965, 95% CI [0.927, 1.000]
Mediated Effect for Enjoyable Dining Experience (a2b2) = 1.444, 95% CI [1.317, 1.594] *
Mediated Effect for Segregation (a4b4) = 1.268, 95% CI [1.198, 1.352] *
B
Environmental Responsibility
Enjoyable Dining Experience
Activation
Segregation
Pro-environmental (vs. Vegetarian) Frame
Vegetarian Choice
a5 = 0.703, p < .001
a6 = 0.156., p < .001
a7 = 0.207, p < .001
a8 = -0.209, p < .001
b5 = 1.076, p = .102
b6 = 1.654, p < .001
b7 = 0.887, p = .056
b8 = 0.654, p < .001
Direct Effect (c2′) = 1.576, p < .001
Mediated Effect for Environmental Responsibility (a5b5) = 1.053, 95% CI [0.990, 1.120]
Mediated Effect for Activation (a7b7) = 0.975, 95% CI [0.946, 1.000]
Mediated Effect for Enjoyable Dining Experience (a6b6) = 1.082, 95% CI [1.033, 1.138] *
Mediated Effect for Segregation (a8b8) = 1.093, 95% CI [1.048, 1.144] *
C
Environmental Responsibility
Enjoyable Dining Experience
Activation
Segregation
Neutral (vs. Vegetarian) Frame
Vegetarian Choice
a9 = -0.592, p < .001
a10 = 1.180., p < .001
a11 = 0.831, p < .001
a12 = -0.757, p < .001
b9 = 1.076, p = .102
b10 = 1.654, p < .001
b11 = 0.887, p = .056
b12 = 0.654, p < .001
Direct Effect c3′ = 0.727, p = .018
Mediated Effect for Environmental Responsibility (a9b9) = 0.957, 95% CI [0.908, 1.008]
Mediated Effect for Activation (a11b11) = 0.905, 95% CI [0.814, 1.001]
Mediated Effect for Enjoyable Dining Experience (a10b10) = 1.810, 95% CI [1.568, 2.098] *
Mediated Effect for Segregation (a12b12) = 1.379, 95% CI [1.287, 1.491] *
D
Environmental Responsibility
Enjoyable Dining Experience
Activation
Segregation
Pro-environmental (vs. Neutral) Frame
Vegetarian Choice
a13 = 1.295, p < .001
a14 = -1.023, p < .001
a15 = -0.625, p < .001
a16 = 0.548, p < .001
b13 = 1.076, p = .102
b14 = 1.654, p < .001
b15 = 0.887, p = .056
b16 = 0.654, p < .001
Direct Effect c4′ = 2.167, p < .001
Mediated Effect for Environmental Responsibility (a13b13) = 1.100, 95% CI [0.983, 1.233]
Mediated Effect for Activation (a15b15) = 1.078, 95% CI [0.999, 1.170]
Mediated Effect for Enjoyable Dining Experience (a14b14) = 0.598, 95% CI [0.523, 0.675] *
Mediated Effect for Segregation (a16b16) = 0.793, 95% CI [0.744, 0.838] *

Figure 6. Mediated effects of the social (vs. vegetarian) frame (Panel A), pro-environmental (vs. vegetarian) frame (Panel B), neutral (vs. vegetarian) frame (Panel C), and pro-environmental (vs. neutral) frame on vegetarian food choice. Mediated effects from Panels A-C were computed in the first parallel mediation model that used the vegetarian frame as the reference category, and mediated effects from Panel D were computed in the second parallel mediation model that used the neutral condition as the reference category. Coefficients labelled with "a" indicate the influence of the corresponding menu conditions on one of the four mediators, whereas coefficients labelled with "b" indicate the relationship between a mediator and vegetarian choice (expressed in odds ratios). All direct and mediated effects are expressed in odds ratios. Significant mediated effects (at $\alpha = .05$) are those whose 95% CIs do not include 1; all significant mediated effects are labelled with * for clarity. All coefficients that are expressed in odds ratios were in log odds units in the original analysis output but were transformed into odds ratios for a more intuitive understanding of the effects.

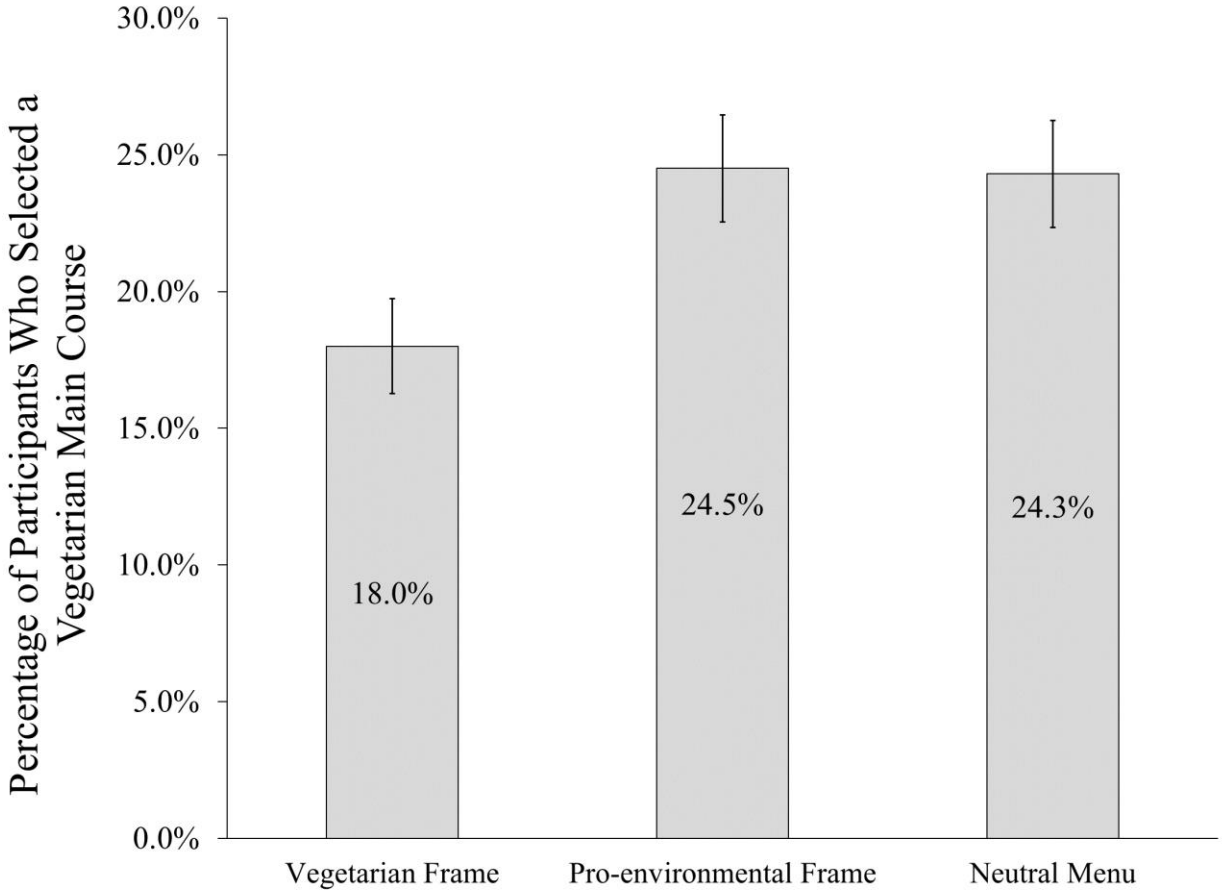
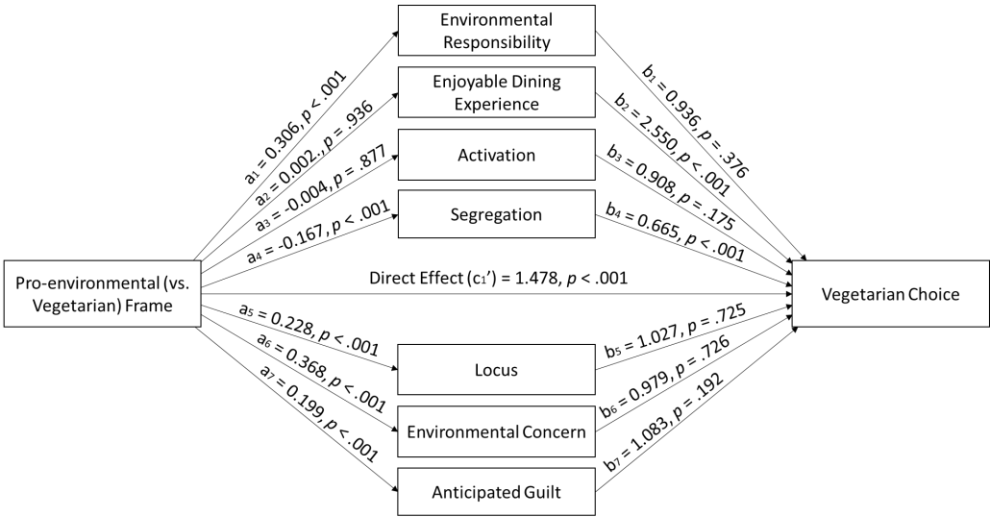


Figure 7. Percentage of participants who made a vegetarian choice in each condition in Study 3. Error bars correspond to the 95% CI calculated using Wilson's (1927) method.

A



Mediated Effect for **Environmental Responsibility**
(a_1b_1) = 0.980, 95% CI [0.936, 1.025]

Mediated Effect for **Enjoyable Dining Experience**
(a_2b_2) = 1.002, 95% CI [0.948, 1.060]

Mediated Effect for **Activation**
(a_3b_3) = 1.000, 95% CI [0.994, 1.008]

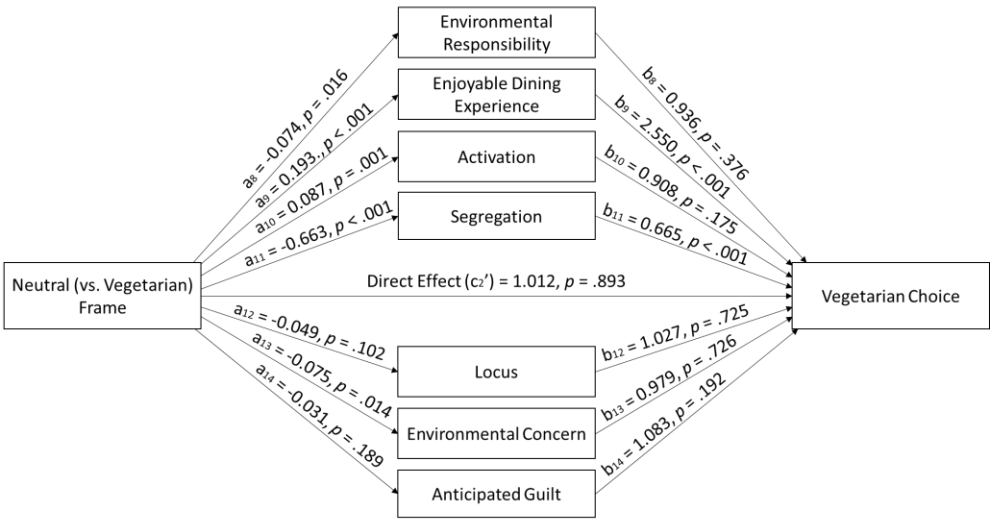
Mediated Effect for **Segregation**
(a_4b_4) = 1.071, 95% CI [1.037, 1.108] *

Mediated Effect for **Locus of Control**
(a_5b_5) = 1.006, 95% CI [0.972, 1.042]

Mediated Effect for **Environmental Concern**
(a_6b_6) = 0.992, 95% CI [0.949, 1.035]

Mediated Effect for **Anticipated Guilt**
(a_7b_7) = 1.016, 95% CI [0.991, 1.042]

B



Mediated Effect for **Environmental Responsibility**
(a_8b_8) = 1.004, 95% CI [0.994, 1.019]

Mediated Effect for **Enjoyable Dining Experience**
(a_9b_9) = 1.198, 95% CI [1.132, 1.276] *

Mediated Effect for **Activation**
($a_{10}b_{10}$) = 0.992, 95% CI [0.976, 1.004]

Mediated Effect for **Segregation**
($a_{11}b_{11}$) = 1.310, 95% CI [1.240, 1.393] *

Mediated Effect for **Locus of Control**
($a_{12}b_{12}$) = 0.999, 95% CI [0.989, 1.007]

Mediated Effect for **Environmental Concern**
($a_{13}b_{13}$) = 1.002, 95% CI [0.992, 1.012]

Mediated Effect for **Anticipated Guilt**
($a_{14}b_{14}$) = 0.997, 95% CI [0.990, 1.002]

Figure 8. Mediated effects of the pro-environmental (vs. vegetarian) frame (Panel A) and the neutral (vs. vegetarian) frame (Panel B) on vegetarian food choice. Although both frames were tested in the same parallel mediation model, we present them in separate panels for the sake of clarity. Coefficients labelled with "a" indicate the influence of the corresponding menu conditions on one of the seven mediators, whereas coefficients labelled with "b" indicate the relationship between a mediator and vegetarian choice (expressed in odds ratios). All direct and mediated effects are expressed in odds ratios. Significant mediated effects (at $\alpha = .05$) are those whose 95% CIs do not include 1; all significant mediated effects are labelled with * for clarity. All coefficients that are expressed in odds ratios were in log odds units in the original analysis output but were transformed into odds ratios for a more intuitive understanding of the effects.

Appendix

Study materials and pre-registrations for each study can be accessed through the Open Science Framework via the following links:

Pre-registered Study 1 - https://osf.io/tqsvw/?view_only=6f49aa157f7e41c783329a66f8dcdb91

Pre-registered Study 2 - https://osf.io/rq5a7/?view_only=2dbb73f316ed491ebdd922a52df923f8

Pre-registered Study 3 - https://osf.io/u9g63/?view_only=1985366b3a244e88b371fd29bbac4f80