

Increasing Sustainable Behaviour with New Approaches to Green Nudging: Introducing the Environmentalist Bias, Scientist Bias, Nudge by Proxy, and Polynudge

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Received March 03, 2024; Revised April 04, 2024; Accepted April 11, 2024

Abstract This paper compares the efficacy of two green nudges that aim to increase low-emission meal choices. The paper explores a direct approach through the use of displaying carbon emissions data (a green nudge) as well as an indirect approach of displaying nutrient data (a green nudge 'by proxy'). In the reported experiment, carbon footprint labelling outperformed the control group by 11.5 percentage points whereas nutrient data labelling outperformed the control group by 24 percentage points. The experiment was conducted online with 600 UK students (every participant was male, aged 18-25, and was non-vegan and non-vegetarian). While further studies are required, the results suggest that simple low-cost or no-cost labelling and signage interventions may be an effective strategy for increasing more sustainable meal choices. The paper introduces and discusses the terms nudge by proxy, polynudge, environmentalist bias, and scientist bias. The paper makes the case for future experiments that further explore the potential of indirect and multidimensional approaches to non-prohibitive interventions.

Keywords: behavioural economics, behavioural science, consumer psychology, nudge theory, green nudges, product labels, plant-based, vegan, sustainability, nudge by proxy, polynudge, scientist bias, environmentalist bias

Cite This Article: Chris Macdonald, "Increasing Sustainable Behaviour with New Approaches to Green Nudging: Introducing the Environmentalist Bias, Scientist Bias, Nudge by Proxy, and Polynudge." *Research in Psychology and Behavioral Sciences*, vol. 12, no. 1 (2024): 1-6. doi: 10.12691/rpbs-12-1-1.

1. Introduction

A green nudge is an intervention that aims to increase pro-environmental choices [1,2,3]. As Thaler and Sunstein note, to count as a mere nudge, the intervention must alter behaviour "without forbidding any options" [4]. Therefore, banning high-emission products such as beef [5,6,7], would not be deemed a green nudge, however, displaying carbon footprint information on menus would be deemed a green nudge as it does not restrict or limit any choices.

Displaying emissions data for food items is an increasingly popular form of green nudge and its efficacy has been explored in multiple studies over the last decade [8,9,10,11,12]. However, as noted by Garnett, of the studies that explore actual behaviour, this form of green nudge shows modest and mixed results (2023). Furthermore, calculating product-specific emissions data and displaying it poses multiple technical challenges [13], and without additional context, it can be difficult for the consumer to interpret this kind of information [14,15]. Moments of infrequent high-price consumption are said to be more optimal situations to leverage such informational interventions [16]. In other words, moments where our thinking is less habitual and more considered—moments where we use System 2 thinking in Kahneman terms [17].

Food consumption can be notoriously unconscious [18,19,20,21] and consumers have been noted as showing little thought over food production and the associated environmental impact [8,22,23]. Furthermore, the locations where we purchase food items (e.g. in a restaurant or cafeteria) can be settings where consumers feel time-pressured to make swift decisions, thus decreasing the potential efficacy of an intervention that reveals new and nuanced information [24,25]. These can also be settings with a wide range of options which can cause the consumer to seek to reduce information via cognitive shortcuts (heuristics and biases)—e.g. social norms [26,27,28] and status quo bias [29,30,31].

In this paper, I explore a potential bias towards displaying the carbon footprint of food choices and I offer an alternative approach to increasing the consumption of sustainable meals.

Environmentalism Bias

In 1977, Ross et al. found that "social observers tend to perceive a false consensus with respect to the relative commonness of their own responses" [32]. In other words, they found that people have the tendency to assume that their own beliefs, judgements, and choices are more common than they are; they overestimate how similar their thoughts are to the general population. Ross et al. coined this phenomenon the false consensus effect (1977).

And, after circa 10 years of subsequent research, meta-analysis, and reviews of over 100 tests, the false consensus effect (FCE) was shown to be pervasive in multiple settings [33,34]. FCE is still frequently explored and researchers continue to find its robustness [35,36].

Given that the aforementioned carbon footprint displays are attempting to reduce negative environmental impacts, it is logical to assume that those exploring such interventions are 'environmentalists': those concerned about negative environmental impacts. Therefore, there may be a bias towards interventions that highlight the environmental impacts as this may resonate with the researchers on a personal level. Due to a potential false consensus effect, they may be under the impression that this kind of information will also resonate with the broader public. In short, there may be an 'environmentalist bias' where researchers intending to reduce negative environmental impacts may tend towards interventions that highlight environmental information and they may overestimate its effectiveness. More broadly, there may be a 'scientist bias', where researchers may tend towards interventions that display some form of specialist scientific data.

Nudge By Proxy

Coined in 2008, the aforementioned term, 'nudge', is still relatively new [4]. While nudges can be named in accordance with their broadly defined intent (e.g. moral nudge [37,38] and green nudge [2,39], there is no such terminology with regard to a nudges specific approach. I propose a useful distinction and subcategory of a nudge is whether it is a direct nudge or a 'nudge by proxy'.

Suppose the goal was to increase healthy food consumption and therefore a researcher experiments with a health nudge. A direct health nudge would be to make health-related information salient (e.g. displaying nutritional information on product packaging). By contrast, a health nudge by proxy might be to leverage social norms with a display that indicates, for example, that 9/10 customers purchase vegetables every time they come to the supermarket. The latter approach is not a direct approach, it is not drawing attention to the intended health benefits or consequences. However, as the desired outcome of more healthy food consumption may be achieved, it acts as a health nudge 'by proxy'. Therefore, a nudge by proxy is used to describe an indirect nudge that achieves a predefined outcome without making reference to it [40]. This may be a useful subcategory as an indirect approach may be used to increase nudge efficacy.

As a further example, a policymaker may wish to encourage commuting by bicycle to reduce carbon emissions. Therefore, they may wish to implement a green nudge, such as displaying information about the reduction of carbon emissions that result from commuting by bike. However, an indirect approach that leverages the potential health benefits may be more effective (e.g. displaying the fat loss potential via the additional calories burned from commuting by bicycle). The latter, indirect approach, would be deemed a green nudge by proxy.

Therefore, a determining factor is the nudge's intent. If one were to display fat-loss data and the intent was to improve public health, then it is a health nudge (a direct approach); if one were to display fat-loss data but the intent was to reduce carbon emissions, then it is a green

nudge by proxy (an indirect approach).

2. Experiment

The experiment compares a green nudge that leverages carbon emissions data with a green nudge by proxy that leverages nutritional data. There are two hypotheses:

H1

Hypothesis 1 is that participants will be more likely to purchase the lower-emission food item when the label includes additional emissions data when compared to the control group where the label only includes product name and cost. This hypothesis is in line with prior studies where it was found that displaying carbon emissions data can be an effective form of intervention when compared to a control group [40,41,11,42,43,44]. Furthermore, prior survey studies suggest that "for the environment" is a significant contributing factor for avoiding the consumption of high-emission food items [46,47,48].

H2

Hypothesis 2 is that participants will be more likely to purchase the lower-emission food item when the label includes additional nutritional data (green nudge by proxy) when compared to the label that includes additional emissions data (green nudge). This finding would be in line with prior research that suggests that nutrition may be the most important influence on menu choices—followed by other more immediate considerations such as taste and cost [49,50,40,45].

Furthermore, prior survey studies suggest that people are more likely to avoid meat consumption for health reasons than environmental reasons [46,47,48]. In addition to this, there appears to be a strong association between consumption of meat products and masculinity, and therefore, a label revealing the high-protein content of the meatless option may help to counteract the potential negative response resulting from gender stereotypes [51,52].

Participants

In the experiment, participants were sent a link giving them access to a private online portal where they were asked to look at a menu and answer a single question: "Which item would you choose from the two-item menu?". 600 UK students took part. Every participant was male, aged 18-25, and was non-vegan and non-vegetarian.

*I wanted to test the hypotheses with men because, on average, men eat more meat and are less likely to avoid or limit meat consumption [53,54,55,56]. Accordingly, they will be a more challenging audience to influence.

Procedure

The participants were randomly assigned to one of three groups: Group C (Control), Group GN (Green Nudge), and Group GNBP (Green Nudge by proxy). There were 200 participants in each group.

In all groups, the menu contained only two items from Greggs (a well-known British bakery chain): a sausage roll, and a vegan sausage roll. Non-fictional items from a well-known organisation with their up-to-date names and costs were selected to more accurately reflect reality. The two items were selected due to their similarities in an

attempt to reduce unintended variables; both items are the same price and are very similar in shape, colour, texture, and taste.

In Group C, the labelling included only the item names and the item costs:

Table 1. Group C menu

Greggs Sausage Roll	£1.20
Greggs Vegan Sausage Roll	£1.20

In Group GN, the labelling included additional carbon footprint data in parentheses:

Table 2. Group GN menu

Greggs Sausage Roll (Carbon footprint = 369gC02e)	£1.20
Greggs Vegan Sausage Roll (Carbon footprint = 71gC02e)	£1.20

In Group GNB, the labelling included additional nutrient data in parentheses:

Table 3. Group GNB menu

Greggs Sausage Roll (Protein = 9.4g)	£1.20
Greggs Vegan Sausage Roll (Protein = 11g)	£1.20

Accordingly, the only difference between the various menus was the additional information added in parentheses: Group C = no additional information; Group GN = carbon footprint data; and Group GNB = macronutrient data.

*Neither a weighted ingredient list nor carbon footprint data was available on the Greggs website. Therefore, carbon footprint values from non-branded similar products were used, which were provided by the Consumer Data Research Centre, University of Leeds [57]. However, macronutrient values were available from the digital menu on the Greggs website (greggs.co.uk/menu).

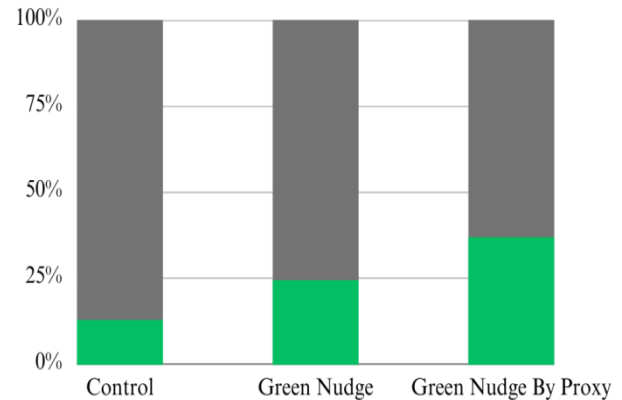
3. Results

In Group C ($n = 200$), 26 participants chose the lower-emission food item; in Group GN ($n = 200$), 49 participants chose the lower-emission food item; and in Group GNB, 74 participants chose the lower-emission food item.

Table 4. Results as totals and percentages (C vs GN vs GNB)

	Group C (control group)	Group GN (carbon data)	Group GNB (nutrient data)
Sausage Roll	174 (87%)	151 (75.5%)	126 (63%)
Vegan Sausage Roll	26 (13%)	49 (24.5%)	74 (37%)

Figure 1. Results as stacked bar graph (C vs GN vs GNB)



*Green = lower-emission food choice, Grey = higher-emission food choice

H1

Hypothesis 1 was that more participants would purchase the lower-emission food item when the label included additional emissions data (Group GN) when compared to the control group (Group C). The data supports this hypothesis as in Group C, 13% of participants chose the lower-emission food item whereas, in Group GN, 24.5% of participants chose the lower-emission food item.

The responses required to assess the hypothesis involve binary categorical variables: either the participants chose the lower-emission food item, or they did not. Accordingly, to assess for statistical significance, I ran a two-sample test for equality of proportions (with a 95% confidence interval)—using Pearson's chi-squared test.

The test revealed that there was a statistically significant difference between Group C and Group GN ($\chi^2(1) = 8.68, p = 0.003$). Therefore, the null hypothesis is rejected and H1 holds.

H2

Hypothesis 2 was that more participants would purchase the lower-emission food item when the label included additional nutritional data (Group GNB) when compared to additional emissions data (Group N). The data supports this hypothesis as in Group GN, 24.5% of participants chose the lower-emission food item whereas, in Group GNB, 37% of participants chose the lower-emission food item.

The responses required to assess this hypothesis also involve binary categorical variables: either the participants chose the lower-emission food item, or they did not. Accordingly, to assess statistical significance, I ran the two-sample test for equality of proportions.

The test revealed that there was a statistically significant difference between Group GN and Group GNB ($\chi^2(1) = 7.33, p = 0.006$). Therefore, the null hypothesis is rejected and H2 holds.

4. Discussion

When aiming to maximise positive impact, behavioural scientists can reflect on both how effective an intervention has been in the lab and how practical the intervention would be in a real-world setting. Part of assessing the latter involves predicting public acceptability of the suggested intervention. However, it is often the case that the interventions that are most accepted by the public are the least effective [16]. In other words, there can be an inverse relationship between what is most acceptable and what is most effective.

In particular, softer-touch interventions such as providing additional information can be deemed more acceptable than interventions that may restrict or eliminate consumer choices [58,59]. In short, as we attempt to move up the intervention ladder (pictured below) [60], we may find greater pushback as the interventions can be deemed as a greater interference on people's lives.

Table 5. Intervention ladder

Eliminate choice
Restrict choice
Disincentives
Incentives
Changing default options
Enable choice
Provide information
Do nothing

Accordingly, by developing more effective forms of non-prohibitive interventions (i.e. exploring new approaches to nudging), we may be able to counteract the inverse relationship between acceptability and efficacy. In the world of agriculture, there is a pursuit of food that is both high-yield yet low-impact, and with new technologies—such as precision fermentation—it may have already been discovered [61,62]. In behavioural science, the 'holy grail' combination may be interventions that are both high-impact yet low-intrusion—the discovery of which may involve experimentation with new forms of non-prohibitive approaches.

In the pursuit of such, this paper has explored the potential increased efficacy of a 'nudge by proxy'. This began by first self-reflecting on potential biases ('environmentalist bias' and 'scientist bias') and then considering possible indirect approaches. The resulting experiment explored using health motivations (nutrient data) to increase more environmentally-friendly meal choices—which outperformed using environmental motivations (carbon footprint data).

This finding was in line with prior surveys (by the organisations Vomad and Veganuary) that explored why people adopted plant-based diets where "for health" was a more common reason than "for the environment". Those prior surveys also reveal the possibility of an even more effective nudge by proxy which leverages motivations to reduce unnecessary suffering to animals.

In the Vomad Survey (12,814 responses), it was found that "for the animals" was identified as the primary reason

that participants became vegan [46]:

Table 6. Vomad Survey

Animals	68.10%
Health	17.40%
Environment	9.70%
Other	4.80%

Congruent with the above results, the most recent Veganuary Participant Survey (16,829 responses) also identified "for the animals" as the leading driving force behind wanting to adopt a vegan diet [47]:

Table 7. Veganuary Survey

Animals	40%
Personal health	21%
The environment	18%
For a change/challenge/out of curiosity	8%
Global health	7%
For a friend/partner/family member	4%
Other	2%

Accordingly, I would encourage researchers to further investigate environmentalist bias, scientist bias, and the potential of a nudge by proxy—in particular, a green nudge by proxy that leverages motivations to reduce unnecessary animal suffering. I would also encourage the exploration of a 'polynudge' that combines multiple motivations (e.g. for the environment, personal health, and animal welfare) as there may be a positive compounding effect.

The multiple nudge types are depicted in the table below (using the example of aiming to increase pro-environmental behaviour):

Table 8. Nudge approach matrix

Intent	To increase pro-environmental behaviour		
Nudge	Green Nudge	Green Nudge By Proxy	Green Polynudge
Approach	Direct	Indirect	Multidimensional
Lever	For the environment	For personal health	For the animals, the environment, and personal health
Outcome	Increased pro-environmental behaviour		

There are multiple complicated and compounding reasons behind why we buy the things we buy [63,64,65,66,67,68,69,70,71,72]. Accordingly, we may require an indirect or multidimensional nudge to effectively influence consumer behaviour.

Is it the case that non-prohibitive interventions are inherently low impact? Or do we need more optimised nudges?—ones that use indirect and/or multidimensional approaches that are guided by key determining factors that are influencing choices in that particular scenario. Or perhaps, a hyper-targeted 'sniper shot' intervention will be the most effective, one that removes the most critical barrier to change—something previously referred to as "situational myth-busting" [40].

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