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RESEARCH ARTICLE

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Nudging green food: The effects of a hedonic cue, menu position, a warm-glow cue, and a descriptive norm

Tommy Reinholdsson[1] | Martin Hedesström[1] | Emma Ejelöv[2] | André Hansla[1] | Magnus Bergquist[1] | Åsa Svenfelt[3] | Andreas Nilsson[1]

[1]Department of Psychology, University of Gothenburg, Gothenburg, Sweden

[2]Department of Space, Earth and Environment, Chalmers University of Technology, Gothenburg, Sweden

[3]Division of Strategic Sustainability Studies, KTH Royal Institute of Technology, Stockholm, Sweden

Correspondence
Tommy Reinholdsson, Department of Psychology, University of Gothenburg, P.O. Box 500 SE-405 30, Göteborg, Sweden.
Email: tommy.reinholdsson@psy.gu.se

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Abstract

Meat consumption is associated with both public health risks and substantial CO_2 emissions. In a large-scale field-experiment, we applied four nudges to the digital menus in 136 hamburger restaurants. The nudges promoted vegetarian food purchases by either (1) changing the menu position of vegetarian food, or aligning vegetarian food with (2) a hedonic, taste-focused nudge, (3) the warm-glow effect, or (4) a descriptive social norm. These nudges were thus aimed to shift salience toward a certain goal or the salience of a specific alternative. Vegetarian food purchases were measured in two datasets analyzing if nudges affected customers' "route" to ordering vegetarian food (29,640 observations), and the total number of vegetarian food sold during the intervention (346,081 observations). Results showed that the position nudge affected customers route to buying vegetarian food. More specifically, making the "green category" more accessible made more customers order through that category. Interestingly, this did not affect the total number of vegetarian sales. However, results indicate that nudges that utilize the salience of goals, in particular hedonic goals, may have an overall positive effect on total vegetarian sales.

1 | INTRODUCTION

Meat consumption has become of matter of concern, both in terms of public health (World Health Organization, 2013) and environmental impact (Birt et al., 2017; O'Mara, 2011; Poore & Nemecek, 2018). The concept of nudging has emerged as a promising alternative and/or complement to governmental regulations of behavior, such as bans, taxes, and laws. Coined by Thaler and Sunstein (2009), nudging refers to a wide palate of subtle influence techniques, aimed at framing a given choice to increase the selection of an alternative without restricting the alternatives available. Lindenberg and Papies (2019) argue that a shift in salience is the essence of nudging. More specifically, goal nudging involves a shift in salience of a (mostly) subconscious goal in the mind of a decision maker, and behavioral nudging involves a shift in salience of a specific alternative. In terms of food choices, both goal nudging and behavioral nudging have been applied with varying degrees of success across many different contexts and populations, utilizing numerous types of nudging techniques (Vandenbroele et al., 2020). As a large-scale decision-making tool, nudging has the potential to make a significant impact. In support of nudging, a recent meta-analysis reported that nudging has a medium sized overall effect on behavior and has positive effects across both choice architecture techniques (e.g., default, social reference, and visibility) and behavioral domains (e.g., health, food, and environment) (Mertens et al., 2022). Re-analyses of the meta-analytic data did however, result in substantially lower effects, sparkling a debate about the effectiveness of nudging interventions (Maier et al., 2022; Szaszi et al., 2022). Another angle on this debate concerns the substantially larger effects of nudging interventions reported in academic research in contrast to when nudging is applied by, for instance, governmental

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nudging units (DellaVigna & Linos, 2022). This calls for further large-scale studies assessing the effectiveness of nudging. It has also been pointed out that nudging research is difficult to generalize to wider populations and contexts, that is, in the messy, message-dense, real-life contexts that consumers navigate in their everyday lives (Lehner et al., 2016). In line with these limitations, significant dispersion across choice architecture techniques and behavioral domains was reported in the meta-analysis by Mertens et al. (2022).

In the current study, our aim is to increase knowledge on the effectiveness of different nudges in specific contexts by comparing four nudges in the food domain. More specifically, we conducted a large-scale field-study where vegetarian food choices are nudged in the digital menu of 136 Swedish hamburger restaurants. The restaurants are dispersed across Sweden in different socioeconomic and geographical contexts. The effects of four different nudging techniques will be examined with the aim to compare their relative efficacy in relation to sustainable food choices. Nudges were included based on their relevance to underlying goals that determine customers' behavior when making food choices, as will be further elaborated below. More specifically, the nudges examined in this study involve (1) normative influence, (2) hedonic influence, (3) a combination of normative and hedonic influence, and (4) moving an alternative (in this case: a food category) to the first position in the menu. The following research questions are addressed: (1) Are sales of vegetarian food alternatives affected by the four respective nudging techniques? (2) Which nudging technique has the largest positive effect on sales of vegetarian food alternatives?

1.1 | Goal nudging and environmental behavior

Goal nudging builds on an understanding of behavior as influenced by the (subconscious) activation of goals which, in turn, accentuate constructs that are relevant to the goal in question (Bargh, 2022; Lindenberg & Papies, 2019). With respect to environmental behavior, these goals can be broadly divided into goal-frames that focalize either normative goals, hedonic goals or gain goals (Lindenberg & Steg, 2007). The hedonic goal-frame and gain goal-frame are inherently more associated with self-related motivations, aimed at pleasure and personal gain. In contrast, the normative goal-frame drives the individual toward becoming part of larger social structures by adhering to norms that define them (Lindenberg & Steg, 2007). While all three goal-frames are concurrently active in any given situation, the baseline configuration is one where the hedonic goal frame is most salient and the normative goal-frame least salient (Lindenberg & Papies, 2019). Accordingly, pro-environmental behavior often involves a conflict between normative and hedonic goals, and interventions often aim to strengthen the normative goal-frame by applying some form of normative influence.

1.1.1 | Normative goal nudging

Social norms are blueprints of socially suitable behavior that guide what people do, think and feel, without the force of law (Cialdini & Trost, 1998). More specifically, descriptive social norms refer to what others appear to do, think and feel, whereas injunctive social norms convey what others appear to think one should do, think and feel (Cialdini et al., 1990). In other words, descriptive norms convey what is and injunctive norms what ought to be. Areas where social norms have been used to influence pro-environmental behavior include littering (Cialdini et al., 1990; De Kort et al., 2008), recycling and conservation behaviors (Goldstein et al., 2008; Schultz, 1999), energy conservation (Allcott, 2011; Bergquist & Nilsson, 2016; Schultz et al., 2007) and food choices (Brunner, 2010; Brunner & Siegrist, 2012; Lally et al., 2011; Mollen et al., 2013).

Food labels are a common method for applying injunctive normative influence, by which the social appropriateness of a product is conveyed for instance by labeling it as "fair trade" or "sustainable". Indeed, sustainable food labels have been shown to affect judgments of taste and health, as well as willingness to pay for an item (Poelman et al., 2008; Wiedmann et al., 2014). These effects seem, however, to rely on consumers' attitudes (Poelman et al., 2008) and subjective understanding of the labels (Janssen & Hamm, 2012; Samant & Seo, 2016a; Samant & Seo, 2016b). The adherence to injunctive norms also depends on the individual's current level of self-regulation (Jacobson et al., 2011; Jacobson et al., 2015) and the social identity of the decision maker (Terry et al., 1999; Terry & Hogg, 1996). Moreover, if a person does identify highly with a certain behavior and it involves a personal (injunctive) norm, studies indicate that normative influence has less impact on the behavior (Schultz et al., 2016; Thøgersen, 2006). These moderating factors may explain why injunctive normative influence using labels often has little to no influence on consumers' food choices (Gadema & Oglethorpe, 2011; Vasiljevic et al., 2015).

In contrast to injunctive norms, descriptive norms are related to more immediate, intrapersonal goals and the low cognitive effort and gut-feelings of the decision-maker (Jacobson et al., 2011; Jacobson et al., 2015). Research shows that descriptive norms are generally more effective than injunctive norms when nudging food alternatives (Lally et al., 2011; Mollen et al., 2013; Robinson et al., 2014), particularly when sustainable food is promoted, as opposed to when unsustainable options are undermined (Melnyk et al., 2013). However, the complexity of normative influence is emphasized by results showing that descriptive norms have no effect on food choices (Richter et al., 2018).

1.1.2 | Hedonic goal nudging

As proposed by Steg, Bolderdijk, et al. (2014), pro-environmental behavior, although often perceived as socially appropriate, is often also perceived as less pleasurable and more effortful. This makes the hedonic goal-frame a potentially powerful influencing factor when nudging pro-environmental behavior. However, utilizing the hedonic goal-frame does not mean making it even more strictly salient than it already is, as this would potentially increase unhealthy choices. For instance, in one study, a "fun" poster by a vending machine led to significantly less healthy choices compared to a "healthy" poster (Stöckli

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et al., 2016). Hence, the hedonic goal-frame should be aligned with the nudged alternative (Steg, Bolderdijk, et al., 2014). For instance, this could be achieved by communicating a more appealing or indulgent description of a food alternative (Bacon & Krpan, 2018; Turnwald et al., 2019). Taste is often the most important determinant of people's food choices, as noted by Turnwald et al. (2019), whose results in four field studies show that "tasty" labels may be more useful than "healthy" labels. Notably, the effect of taste-focused labeling may be moderated by the strength of the hedonic values of a consumer, as indicated by studies that link hedonic values with a wide range of environmental behaviors, such as car use, showering time and meat consumption (Steg, Perlaviciute, et al., 2014). Bacon and Krpan (2018) also show that past behavior (or the personal norm of the customer) moderates the effect of taste-focused hedonic goal nudging on food choices. Specifically, Bacon and Krpan found that a more appealing description increased the likelihood that infrequent eaters of vegetarian food would select a vegetarian dish but reduced it for more frequent eaters of vegetarian food. This emphasizes the need to consider the context when applying hedonic goal nudging, as the effect may be negative in a context with more frequent eaters of vegetarian food.

1.1.3 | Aligning normative and hedonic influence

A fundamental means to increase pro-environmental behavior is to decrease the conflict between normative and hedonic goals by aligning the normative goal-frame with the hedonic goal-frame (Steg, Bolderdijk, et al., 2014). The aim of such an effort could be to present information that gives rise a sense of feeling good (a hedonic goal) by doing good (an injunctive norm-related goal), thus utilizing the mechanism known as the warm-glow-effect (Andreoni, 1989; Andreoni, 1990). In terms of pro-environmental behavior, Taufik et al. (2015) illustrated the warm-glow effect in two studies showing that participants felt good when learning that they had behaved in an environmentally friendly manner. In conceptual symmetry, a person who feels positive emotions generally behaves in a more environmentally friendly manner (Ro et al., 2017) and the mere anticipation of positive emotions has been shown to induce pro-environmental behavior (Bergquist et al., 2020; Taufik et al., 2016). In a field study on recycling and donation behavior, what could be conceptualized as a warm-glow nudge was designed to create an anticipation of positive emotions and elicited a stronger effect than a descriptive-injunctive norm (Bergquist et al., 2020).

1.2 | Behavioral nudging and environmental behavior

While goal nudging aims to increase the salience of a certain goal, behavioral nudging increases the salience of a certain alternative (Lindenberg & Papies, 2019). In other words, behavioral nudging refers to forms of nudging that shift attention and behavior toward a certain alternative, whereby various heuristics and biases (see e.g., Kahneman, 2011) increases the chance that this alternative will be selected. A common form of behavioral nudging is the use of default options (e.g., when a pro-environmental alternative is selected by default) (Ölander & Thøgersen, 2014). In relation to food choices, a behavioral nudging technique that has received a great deal of attention in research involves placing a certain alternative in a prime position among other alternatives. We will refer to this as positional nudging.

1.2.1 | Positional nudging

There are several interrelated proposed motivations for why an option would "feel right" if presented, for example, at the top of a list. One reason is that the choice becomes less effortful (Steg, Bolderdijk, et al., 2014); another is its appeal to subconscious cultural associations of "up" with good and "down" with bad (Meier & Robinson, 2004). Similarly, alternatives that are presented first in a horizontal list may be implicitly conceived as better in a competitive evaluation of alternatives (Mantonakis et al., 2009).

The effect of the order of presentation on people's food choices has consistent support in previous research. For example, in a field study that focused on the 60-item menu of a café, the selection rate of items at the top or bottom of a menu category (including 4–10 alternatives) was up to twice as high as in the middle position (Dayan & Bar-Hillel, 2011). Another study found that the selection rate of the vegetarian lunch option increased by 6% when (in combination with increased salience in the food display of the lunch restaurant) it was moved to the top of the menu (consisting of three lunch options) (Kurz, 2018). In a similar field experiment conducted at a university cafeteria, placing a vegetarian option (instead of a meat option) at the top of the menu decreased the share of meat dishes sold by 11%, reflecting a 6% decrease of daily emissions due to food sales (Andersson & Nelander, 2021). In a further example, Schmidtke et al. (2019) compared sales of (sugary) Coca Cola and (nonsugary) Coke Zero at 511 McDonald's before and after the implementation of a nudge intervention. Before the intervention, Coca Cola was positioned in the top-left corner of the touchscreen (where customers place their orders). During the intervention, the positioning of the two items were switched, so that it was instead Coke Zero that was placed in the top-left corner of the screen (i.e., first). As a result, sales of Coca Cola decreased significantly and sales of Coke Zero increased significantly, compared to before the intervention.

1.3 | The current study

Previous research shows the value of utilizing both goal nudging and behavioral nudging to increase choices of vegetarian food alternatives. Specifically, normative influence represents a widely used and promising method to influence food choices (Robinson et al., 2014), yet past research has also reported that social norms did not influence

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consumer behaviors (Bergquist et al., 2020; Richter et al., 2018). Another promising type of influence involves hedonic-focused content, which, however, has received limited attention in research, (Schneider et al., 2021).

The overall purpose of this study is to expand knowledge of how nudging can be applied to increase vegetarian food choices. Serving this purpose, the specific aim is to examine, evaluate and compare the effects of four different nudging techniques on sales of vegetarian food alternatives, when applied in the menu of 136 hamburger restaurants. Above and beyond the value of conducting a large-scale nudging intervention of food choices in fast-food restaurants, this study will add to current knowledge by simultaneously examining the effects of four contextually relevant nudges. As discussed by Lehner et al. (2016), the effect sizes of nudging interventions are often strikingly diverse, indicating that diverse contexts and populations make it difficult to generalize the effects of a nudging technique across contexts and populations. It follows that it is also problematic to compare the effects of different nudging techniques when they have been applied in different field studies, favoring a design where nudges of interest can be compared relative to each other in the same setting. Accordingly, this study could further the knowledge not only of the general usefulness of nudging in an important real-life context, but also clarify which of the nudging techniques may be most useful in large-scale nudging interventions of vegetarian food choices.

The nudges involved (1) normative influence, (2) hedonic influence, (3) a combination of normative and hedonic influence, and (4) positional nudging. Two research questions guided the implementation of the four nudges, and subsequent analysis and discussion:

1. Are sales of vegetarian food alternatives affected by the four respective nudging techniques?
2. Which nudging technique has the largest positive effect on sales of vegetarian food alternatives?

2 | METHOD

2.1 | Setting

The study was conducted in collaboration with the Swedish fast-food company MAX Burgers. MAX is currently represented by 136 restaurants in Sweden and is, as a business, similar to, for example, McDonalds and Burger King. In their PR activity, MAX conveys a clear stance in support of environmental initiatives, which is also evident in their venues, where a variety of messages express MAX's active effort to reduce their carbon footprint.

Customers at MAX use interactive digital menus that can be accessed at so-called express stations in or immediately outside the venue. In the menu display, customers are presented with an interactive grid of clickable images, depicting the main food categories in rows of three alternatives, stacked on top of each other. The food categories are as follows: (1) Meals, (2) Kids' menu, (3) Premium Shakes, (4) Coffee & Desserts, (5) Burgers, (6) Green, (7) Chicken, Fish & Salads, (8) Sides & Dips, (9) Homeburgers, and (10) Drinks & Shakes. By tapping on one of these categories, a submenu opens where customers specify their food choice by selecting which food item they want to order.

FIGURE 1 The message-based nudges. "Många här väljer grönt!" (descriptive norm) translates to "Many here choose green!"; "Det gröna valet smakar bra!" (hedonic) translates to "The green option tastes good!"; "Det gröna valet känns bra!" (warm-glow) translates to "The green option feels good!"

The field experiment was conducted at each of MAX's 136 venues in Sweden, between April 12 and April 23, 2021. During this time, there were no holidays or otherwise nationally relevant events. To avoid potentially confounding factors pertaining to weekends, data was only collected on Monday to Friday each week. Baseline sales data for the 5 weeks (March 8 to April 9) before the intervention was also collected, excluding Saturdays and Sundays.

2.2 | Intervention

The intervention involved four different nudges that were applied (on different days) in the express station menu. All four nudges were applied to the "Green" food category, which contains the restaurants' vegetarian and vegan food. To aid readability, the alternatives offered in the "Green" category are referred to as "vegetarian" throughout the article, despite also including vegan options.

The nudges involved (1) normative goal-nudging ("the descriptive norm nudge"), (2) hedonic goal-nudging ("the hedonic nudge"), (3) a combination of normative and hedonic goal-nudging ("the warm-glow nudge"), and (4) positional nudging ("the position nudge"). A control condition was included (presenting the original menu) to represent the baseline level of vegetarian sales. In addition, we obtained sales data from Monday to Friday of the 5 weeks prior to the two intervention weeks. The position nudge involved moving the icon representing the "Green"

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category from the sixth position in the grid of icons in the menu (out of 10) to the first position. The other three experimental conditions involved a message and a matching illustration that were added next to the icon representing the "Green" food category (see Figure 1).

The messages, or cues, were phrased to read easily while, importantly, distinctly inducing the desired shift in goal-frame salience. Specifically, the descriptive norm message read (translated from the original phrase in Swedish) "Many here choose green!", which was accompanied by a minimalistic illustration of three people. The hedonic message read (translated from Swedish) "The green option tastes good!" and was accompanied by an emoji with its tongue on one side of its mouth, conveying a sense of tastiness and fun. Finally, the warm-glow message read (translated from Swedish) "The green option feels good!" and was accompanied by a happy emoji with a halo, conveying a sense of feeling good by doing good.

The five conditions were cycled through the menu on one-day intervals, totaling 2 days per condition. The 2 days when each condition was implemented were selected by first randomizing the five conditions across the first week of the intervention. Second, the numerical representation of the day when the first implementation of a condition occurred was subtracted by three, thus selecting the second day of implementation. This was done to achieve as broad a spread as possible among the conditions, resulting in the following plan for implementation: Week 1: Monday: descriptive norm; Tuesday: warm-glow; Wednesday: hedonic; Thursday: control; and Friday: position. Week 2: Monday: control; Tuesday: position; Wednesday: descriptive norm; Thursday: warm-glow; and Friday: hedonic.

2.3 | Measurements

Two sets of sales data were obtained from MAX. In short, the two datasets, while both measuring vegetarian food sales, contain different units of measurement and include data from different food categories on MAX's menu.

2.3.1 | Green category sales

The nudge intervention was applied to the "Green" category in the express station. Importantly, when customers order food via the express station, vegetarian food alternatives can be accessed through either the "Green" category or the "Meals" categories. The first measure "green category sales" are thus measuring number of sales of vegetarian meal combinations (i.e., a main food item including a side and a drink) that were made in the "Green" category. Importantly, this dataset shows which category a customer used to make the purchase of a vegetarian meal combination (i.e., the "Green", nudged category, or the "Meals" category). Accordingly, green category sales provided data that show the route by which sales of vegetarian meal combinations were made via the "Green", nudged category or the "Meals" category. In total, the dataset with green category sales included 29,640 observations of meal combinations sold through both categories.

2.3.2 | Total vegetarian sales

In contrast to green category sales, the unit of measurement in "total vegetarian sales" was not meal combinations, but single food items sold in all food categories. In other words, total vegetarian sales included the total number of sales of single food alternatives on MAX's menu, regardless of whether the food item was sold as part of a meal combination or as a single. Importantly, while vegetarian options were only offered in four food categories, no information is provided in this dataset as to which category a customer used to make a purchase. It should be noted that total vegetarian sales did not include food items sold in the categories "Premium Shakes", "Coffee & Desserts", "Sides & Dips", "Homeburgers", and "Drinks & Shakes". In addition, the category "Kids' menu" was excluded in the analysis, mainly because the ordering system in this category was different from other categories. In total, the dataset with total vegetarian sales included 346,081 observations, excluding the preintervention period.

See Figure 2 for an abstraction of the digital menu and the content of both measures.

2.4 | Analysis

The dataset with green category sales shows the number of vegetarian meal-combination alternatives that were purchased through the food categories "Green" and "Meals". Accordingly, an outcome for us to consider was the percentage of vegetarian meal-combination sales purchased through the "Green" nudged category for each day of the intervention. A second outcome was the overall percentage of vegetarian food sales for each day of the intervention, regardless of purchase route, as per the content of total vegetarian sales.

To determine whether sales of vegetarian meal combinations through the nudged category were affected by the study conditions, a 2×5 chi-square test for independence was conducted (category [green vs. meals] $\times$ nudge [baseline vs. descriptive norm vs. hedonic vs. warm-glow vs. position]). To examine whether each experimental condition differed significantly from the control condition, confidence intervals for the proportional differences were calculated. The same analytical process was used in relation to both outcome variables (i.e., sales of vegetarian meal combinations through the "Green" category and the overall percentage of vegetarian food sales). Analyzing total vegetarian sales, a regression line controlling for sales volume was fitted to the sales data for the 10 days of the intervention. Confidence intervals were then calculated for each data point.

3 | RESULTS

3.1 | Green category sales

Our analysis first focused on whether sales of vegetarian meal combination through the "Green" food category were affected by the nudges. This was achieved by analyzing green category sales, which

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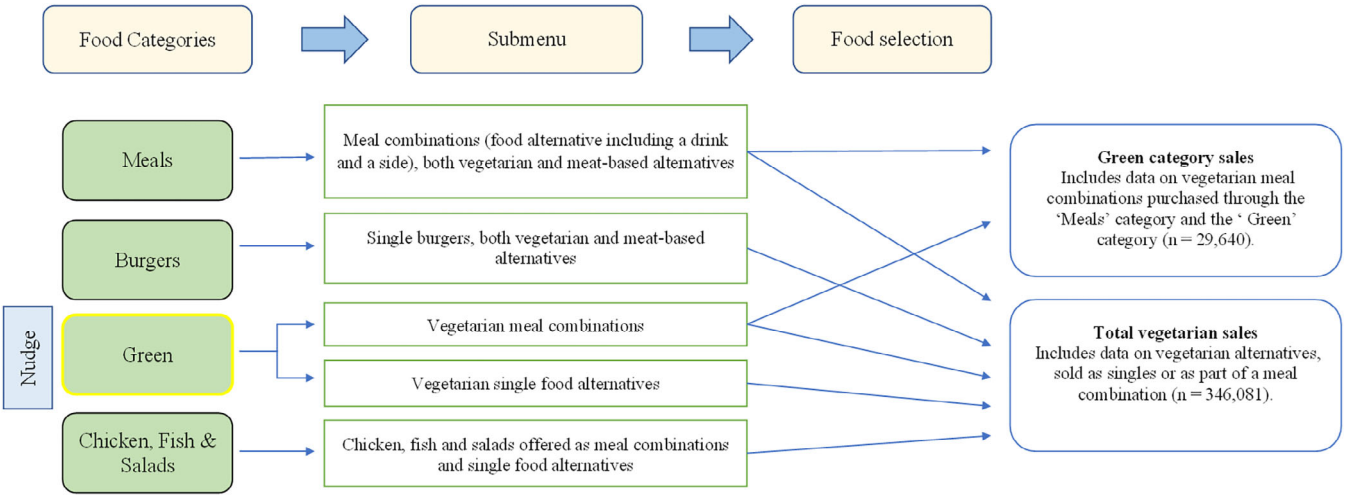

FIGURE 2 Illustrating the user interface flow for the express stations, and the content of both datasets.

included 29,640 observations of sales via the two menu categories that were observed ($n^{\text{control}} = 5438$, $n^{\text{desc. norm}} = 5350$, $n^{\text{position}} = 6560$, $n^{\text{warm-glow}} = 5260$, $n^{\text{hedonic}} = 7032$). Of these observations, 19,290 purchases were made through the "Green" nudged category: control = 64.49%, descriptive norm = 63.83%, position = 66.40%, warm-glow = 65.70%, hedonic = 64.79%. A 5 × 2 chi-square test (nudge [control vs. descriptive norm vs. position vs. warm-glow vs. hedonic] × purchase route [green category vs. meals category]) revealed a significant association between exposure to a nudge and sales in the nudged category (χ^2 [4, 29,640] = 10.71, $p < .05$, $\phi_c = .02$).

Confidence intervals were calculated for the proportional differences between the control condition and each experimental condition. Revealing that the impact of the position nudge was positive and statistically significant (+1.91), 95% CI [0.20, 3.62]. None of the other nudges were significantly different from the control condition: warm-glow nudge (+1.21), 95% CI [−0.59, 3.02], hedonic nudge (+0.30), 95% CI [−1.39, 1.99], the descriptive norm (−0.66), 95% CI [−2.47, 1.15]. These differences converted to a 2.96% increase of sales via the nudged category for the position nudge, a 1.88% increase for the warm-glow nudge, a 0.47% increase for the hedonic-based nudge and a 1.02% decrease for the descriptive norm nudge.

By measuring green category sales, information could be inferred about the route by which customers made vegetarian meal combinations purchases, via the "Green", nudged category or the "Meals". The green category sales do not, however, show if the total number of vegetarian sales was affected by the nudge.

3.2 | Total vegetarian sales

For total vegetarian sales, we examined whether overall sales of vegetarian alternatives were affected by the nudges, regardless of which category the purchase was made through. A total of 346,081 sales were recorded during the time of the intervention ($n^{\text{control}} = 62{,}538$, $n^{\text{desc. norm}} = 59{,}484$, $n^{\text{position}} = 74{,}936$, $n^{\text{warm-glow}} = 59{,}401$, $n^{\text{hedonic}} = 89{,}722$). During the intervention, 18.46% of all sales were vegetarian sales. 18.00% vegetarian sales were made in the control condition, 18.07% in descriptive norm, 18.00% in position, 17.92% in warm-glow, and 19.80% in hedonic. A 5 × 2 chi-square test (nudge [control vs. descriptive norm vs. position vs. warm-glow vs. hedonic] × food type [vegetarian vs. meat-based]) revealed a significant association between exposure to a nudge and food type purchased (χ^2 [4, 346,081] = 143.45, $p < .001$, $\phi_c = .02$).

Confidence intervals were calculated for the proportional difference between each experimental condition and the control condition. These revealed a significant positive impact by the hedonic nudge on sales of vegetarian food items (+1.80), 95% CI [1.40, 2.20], which converts to an 10.00% increase of vegetarian sales. None of the other nudges were significantly different from the control condition: descriptive norm (+0.1), 95% CI [−0.4, 0.5], warm-glow (−0.1), 95% CI [−0.5, 0.4], and position nudge (0.0), 95% CI [−0.4, 0.4].

These results should however be interpreted with caution, as we obtained a positive association between total number of sales and total number of vegetarian sales. That is, on days when more people visited the restaurant the relative number of vegetarian sales increased. This effect introduced a confounder in the data because some of the nudges were evidentially implemented on days with lower total sales, while other were implemented on days with higher total sales. This confound may have caused the increased sales in the hedonic nudge, because one of its two implementation days had extremely high total sales. To evaluate if the total number of sales can explain the increase in vegetarian sales during the hedonic nudge, we analyzed baseline data from 5 weeks before the intervention. During the baseline, we did indeed obtain a positive association between total number of sales and vegetarian sales ($r = .55$, $p = .005$, $n = 25$). Constructing the baseline, we also summed the

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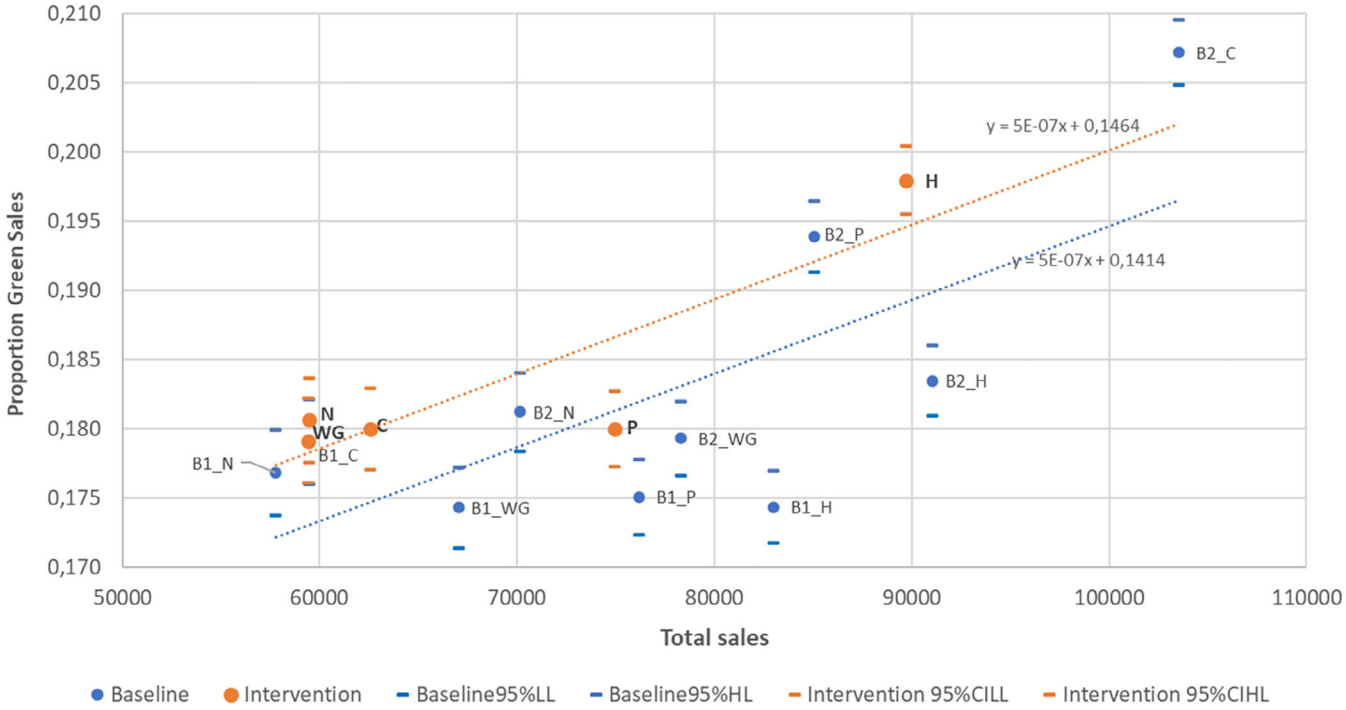

FIGURE 3 Proportion green sales related to totals sales before (baseline-control weeks) and during the two intervention weeks. C = control, N = norm, WG = warm glow, H = hedonic, P = position, B = pair of baseline days from the second and third (1) and the fourth and the fifth (2) baseline weeks matched to the intervention days.

sales across pair of days from two baseline weeks matching the pair of days used when the interventions were implemented. To clarify, matching the days of the hedonic intervention, which was implemented on Wednesday (Intervention Week 1) and Friday (Intervention Week 2), two baseline controls for the hedonic nudge were constructed in the sum of sales across these 2 days during the second and third baseline-weeks (Baseline 1), and the fourth and the fifth base-line weeks (Baseline 2). Pairs of days from the first single baseline week could not be matched to the interventions spanning 2 days across 2 weeks. Hence, sales from the first baseline week were not included in the baseline.

When analyzing the regression line from the baseline in relation to the obtained vegetarian sales during the intervention, we found that the increased vegetarian sales for the hedonic nudge cannot be fully explained by increased total sales (see Figure 3).

In sum, results first showed that customers' "route" when ordering vegetarian food was only affected by the position nudge. Hence, making the green category more accessible by changing its position did indeed nudge customers' behavior when ordering food. Importantly, since customers could take multiple routes to make an order of vegetarian food, shifting purchase route did not necessarily affect the total vegetarian sales. When analyzing the total number of vegetarian sales, we found that the hedonic nudge increased the total number of vegetarian sales, even when controlling for total sales volume. Notably, all goal nudges had positive (albeit) small effects when controlling for total sales.

4 | DISCUSSION

The purpose of this field experiment was to assess and compare nudges designed to promote vegetarian food choices. By investigating four nudging techniques simultaneously, the intention was to gain a better understanding of which type of nudge is most useful in the given context. Specifically, the focus was on whether the nudges affected the percentage of vegetarian meal sales that were made via the nudged "Green" food category. We also investigated whether the nudges affected the percentage of vegetarian sales overall, regardless of which category the purchase was made in. Three nudges were designed to frame a certain goal in the mind of the customer (in addition to making the alternative more salient in the menu). These were message-based and conceptualized as a descriptive norm cue, a hedonic, taste-focused cue, and a warm-glow cue. The fourth nudge, the position nudge, represented a more purely behavioral form of nudging, making the nudged food category more salient and easier to access.

Before diving into our interpretation of the results, the design of this study and the nature of the data need to be addressed. More specifically, the nudges were applied to a food category and not to specific food items. In addition, we received two datasets that not only added greater complexity to the interpretation of our results but also opened up additional avenues for understanding how the nudges affected customers' behavior. The data for green category sales provided an indication of customers' tendency to purchase vegetarian

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food in, specifically, the nudged food category. The total number of vegetarian sales gave information regarding customers' tendency to purchase vegetarian food items overall, regardless of how they navigated the menu. In other words, our analysis of the total number of vegetarian sales allows for insight into the extended impact of the nudges, while our analysis of green category sales allows for insight into the more immediate behavior that the nudges induced.

4.1 | The nudges' effects on green category sales

Overall, the results revealed a significant association between exposure to a nudge and sales in the nudged category. Compared to the control group the impact of the position nudge was positive and statistically significant. The warm-glow and hedonic nudge showed a positive nonsignificant relation to green category sales, while the descriptive norm nudge was negatively and nonsignificantly related.

That the position nudge increased green category sales is expected. Informed by the parallel lack of a position effect on total vegetarian sales (discussed later), we interpret this effect as driven by first and foremost vegetarian customers preferring a relatively easier/quicker route to a vegetarian purchase (i.e., green category first in order) over the relatively more difficult/slower route to such purchases. The more difficult/slower route applied to both the control setting and the other goal nudges, where the green category was on the fourth position. The nudges' effects on overall vegetarian sales

The content of the total number of vegetarian sales dataset enabled us to analyze overall vegetarian sales (i.e., without accounting for the category a sale was made in). This allows for an understanding of the nudges' effects extending beyond the customers' initial exposure to them. The results show that even if the position nudge increased sales in the nudged category, this effect did not translate into more vegetarian sales overall. The results also showed that the hedonic nudge had an overall positive effect on customers' tendency to buy a vegetarian alternative, while the effects of the other nudges were essentially null. In the case of the position nudge, this means that while vegetarian sales were shifted toward the nudged category, customers' overall tendency toward vegetarian alternatives was unaffected.

Digesting these results, we return to Lindenberg and Papies' (2019) concepts of goal nudging (which involves a shift in the salience of a goal-frame) and behavioral nudging (which involves a shift in the salience of a particular alternative, or, in this case, a food category). In practical terms, it should first be noted that most (if not all) nudging techniques involve aspects of both goal-nudging and behavioral nudging, although in different proportions. In the current study, the message-based nudges (i.e., the descriptive norm nudge, the hedonic nudge, and the warm-glow nudge) can be described as having an initial effect on customers' behavior using behavioral nudging. That is, the "Green" food category became more salient because of the graphical and semantic content of the nudge (which was applied next to the category icon). The intention behind these nudges, however, was mainly to influence the goal-frame of the customers, an effect which, importantly, extends beyond the initial choice of entering or not entering the nudged category. The position nudge, on the other hand, can be described as (predominantly) involving behavioral nudging, whereby the nudged category becomes more salient and convenient by being placed in the first position.

The hedonic nudge had the largest effect on overall vegetarian sales, suggesting that presenting vegetarian choices as a "tasty choice" has the potential to increase vegetarian sales in the current setting. Potentially, this may be because the hedonic nudge successfully strengthened the hedonic goal-frame while at the same time alinged it with vegetarian food. It is also possible that a stronger hedonic goal-frame may have become aligned with other goals concerning health and environmental benefits. In other words, making a choice that is both healthier and have less environmental impact, and at the same time tasty, makes the choice more attractive. Although conceptually close to the hedonic nudge, the warm-glow nudge had no significant overall effect on total vegetarian sales. This stands in contrast to the study by Bergquist et al. (2020) where the warm-glow nudge did have a positive effect on recycling behavior. Potentially, the reason for this discrepancy can be attributed to contextual factors that make the warm-glow nudge more useful in settings where the hedonic goal-frame is initially less salient.

The position nudge's (lack of) effect on overall vegetarian sales, in contrast to its positive effect on sales in the nudged category, can be explained in part as an effect derived from it being a more homogenous form of nudging, as opposed to the others. In other words, the position nudge can be described as involving a relatively pure form of behavioral nudging. That is, having affected customers' initial choice in the first step by making the "Green" category more salient, the primacy of the hedonic goal frame was unchanged in the customers' subsequent interaction with the menu alternatives. In other words, making the "tasty choice" was likely the main priority in the subsequent navigation of the menu (Aggarwal et al., 2016).

Finally, the descriptive norm nudge stood out as having no effect (non-significant negative) on sales in the nudged category, or on overall vegetarian sales. As previously discussed, this may be rooted in the fact that many customers have strong personal norms concerning food, which moderate the effect of the nudge (Schultz et al., 2016). Another possible cause is the design of the nudge, with the phrase "Many here choose green". In contrast to other studies (e.g., Goldstein et al., 2008) using a descriptive norm clearly conveying the normative majority in terms of percentage points, the phrase "Many here choose green" is relatively vague in comparison, and hence, perhaps not as effective.

4.2 | Limitations

Although there are advantages that come with conducting research in natural settings, mainly in terms of ecological validity, there are also downsides. One such downside lies in the lack of control over unforeseen, and often entirely unseen, circumstances that may affect both the plan for implementing the study design and the results. In future studies a more rigorous approach to finding a baseline would

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alleviate some of these concerns. For example, this could have been achieved if all experimental conditions were applied on the same days, but at different express stations. Unfortunately, in this study, restrictions in the IT-systems of the restaurants excluded this solution. An additional factor that could be taken into further consideration is the operationalization of the constructs conveyed in the message-based nudges. With respect to the descriptive norm, it is possible that the lack of effect can partly be explained by the vaguely defined reference group. For instance, Goldstein et al. (2008) found an effect of a descriptive norm that clearly communicated the size of the reference group. The operationalization of the hedonic and warm-glow nudges may also have impacted the magnitude of their effects. They were designed to convey the underlying construct in an unambiguous and explicit manner, hence their crudeness (e.g., "The green option feels good!"). An alternative strategy, which may have rendered stronger effects, would be to use more implicitly conveyed messages, for instance by using imagery or metaphoric language that is associated with positive emotion. Finally, it should be noted that data was gathered during the Covid-19 pandemic, meaning that social behavior may have deviated from normalcy in a potentially confounding manner.

5 | CONCLUSION AND IMPLICATIONS

An important feature of the current study lies in the simultaneous investigation of several types of different nudging techniques in a context where nudging food choices can have a significant impact. In terms of the more immediate behavior of entering (and purchasing) vegetarian food in the nudged category, our results show that a position nudge may be most useful. Our findings also indicate that when there are additional steps for the customer to navigate between the nudge and the focal behavior (purchasing vegetarian food in this case), goal-framing effects become relevant to consider. The goal-framing effect of the hedonic nudge is discussed as explaining its positive overall effect on vegetarian sales.

Finally, it should be noted that although a nudging intervention such as the current one may not induce any overwhelmingly large effects on customers' behavior, the practical implications across time may still be significant. For example, the effect of the hedonic nudge on overall vegetarian sales would, roughly calculated, translate to an increase of approximately 140,000 sales of vegetarian options for MAX over a full year (based on an estimate of 7,8 million sales each year, excluding Saturdays and Sundays). In addition to the immediate pro-environmental value that these 140.000 vegetarian sales represent, it is perhaps even more important to consider their potential contribution to emerging habits and shifting trends across time. Indeed, such a contribution may reflect the true value of nudging behavior toward slightly better alternatives.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Tommy Reinholdsson https://orcid.org/0000-0003-3177-5389
Emma Ejelöv https://orcid.org/0000-0003-3530-6870
André Hansla https://orcid.org/0000-0001-9160-8553
Magnus Bergquist https://orcid.org/0000-0002-4363-4834

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AUTHOR BIOGRAPHIES

Tommy Reinholdsson is a PhD student at University of Gothenburg. His research interests include social identity and social, cognitive and emotional influences of behavior, aimed at sustainable development.

Martin Hedesström is an associate professor of Psychology at University of Gothenburg. His research is predominantly experimental, exploring issues concerning choice architecture interventions, often with a sustainability focus. An additional research interest is financial decision making.

Emma Ejelöv is a post-doc at Chalmers University of Technology. Her research focuses on sustainable food consumption and policy acceptability.

André Hansla is an associate professor of Psychology at the University of Gothenburg. His research spans environmental, social, and economic psychology. A recurring research question is how individual and situational factors interact in relation to sustainable consumption of resources.

Magnus Bergquist, PhD, works as a researcher in environmental psychology at the University of Gothenburg, Sweden. He has studied pro-environmental interventions in both field- and experimental settings, focusing on how social psychological factors can motivate and promote pro-environmental behavioral change.

Åsa Svenfelt is a PhD and researcher at the KTH Royal Institute of Technology, Stockholm. Her main research field is transformative futures studies, environmental justice, and sustainable consumption.

Andreas Nilsson, professor at University of Gothenburg, is an applied social psychologist, whose research focuses on social influence, cognition, and behavior. Much of his research involves the application of social psychological principles or methods to understand and solve social problems. Recent projects include studies on congestion charges, behavioral dimensions of climate change, nudging healthy food choices, energy behaviors in households, social norms and behavioral change, and public attitudes toward environmental policy measures.

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