Digital nudges to stimulate healthy and pro-environmental food choices in E-groceries

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Abstract

In response to the detrimental health- and environmental impacts of European consumers' dietary patterns, Nutri-Scores and Eco-Scores have been introduced on packages as guidance for choices. Whereas the scores are promising to improve food choices from a nutritional point of view, the scant available literature suggests very limited effects on the environmental impact of food choices. Therefore, there remains a need to explore ways to bring about improvements in both areas. As a growing share of consumers buys food groceries online, new opportunities to steer food choices are being created. This article explores the potential of several digital functionalities to further stimulate healthier and pro-environmental food choices amongst consumers. These functionalities included product recommendation agents, product scores, a real-time average impact score of the chosen food basket and a personalized social norm. Those were tested in a two-stage randomized controlled trial with 1000 Belgian household food decision makers in a mock-up E-grocery. Indices reflecting the nutritional quality (NQI) and environmental impact (EII) of the selected food baskets were calculated. The results indicate that at first, displaying a combined Nutri- and Eco-Score at product level led to improved NQI's, but not EII's. However, the scores also led to shifting behaviour in EII's when facilitated with recommendation agents. The display of the average impact scores of the selected basket and of social norms did not lead to additional improvements. Hence, a combined Nutri- and Eco-Score labelling system is recommended, but an enabling environment to consider both scores is important to realize a shift towards more healthy and environmentally friendly food choices. Apart from manifesting healthier and environmentally friendly products with a centralized labelling system, improving their accessibility should be considered at least as important for behavioral changes.

FOP-labelling - food choice – sustainability – nutrition – nudging – E-grocery

1. Introduction

Our food system is an important driver for climate change and environmental degradation on the one hand, and is linked to several (deadly) chronic diseases due to affluent dietary habits on the other hand (Gerten et al. 2020; Poore and Nemecek 2018; Westhoek et al. 2014). These threats to the environment and public health, can be attributed to dietary patterns including relatively high intakes of (red) meat, processed food and total calories and low intake of fruits and vegetables (Tilman and Clark 2014). Several studies on the environmental impact of our food system support the notion that inducing changes in consumption patterns has more impact-reducing potential than increasing production efficiency (Gerten et al. 2020; Keating et al. 2014). Moreover, such a demand-driven transition towards more environmentally friendly diets can simultaneously reduce pressure on our health system and on the global environment (Biesbroek et al. 2014).

Throughout the past decades, a switch to healthy and environmentally friendly diets has been promoted by countless Front-of-Package labels (FOP) on food products. Unfortunately, a growing body of literature has been pointing out the limited role of such FOP labels in consumers' food choices (Grunert et al., 2014; Ikonen et al., 2019). Confusion and mistrust amongst consumers, caused by the wide diversity of existing FOP-labels, could partly explain this limited role (Askew 2018; Tonkin et al. 2016). A need for more uniform communication has been widely recognised by consumers, industry and policy makers. Therefore, the European Commission (EC) committed in their Farm-to-Fork strategy to develop a harmonised and activating labelling system, covering health, environmental and social impacts of food (European Commission 2020).

From a nutrition point of view, the introduction of Nutri-Score in various European countries has been contributing to this harmonization. Moreover, recent evidence has shown that Nutri-Score could lead to healthier food choices amongst consumers and reformulation amongst producers (Egnell et al. 2018; Vandevijvere et al. 2020; Vermote et al. 2020). A similar standardization is ongoing with the spread of Eco-Scores, reflecting products' environmental footprints (PEF) (European Commission 2019). A few studies report more pro-environmental food choices due to Eco-Scores alone (Vlaeminck, Jiang, and Vranken 2014; Weber 2021). However, an increasing number of retailers and manufacturers are now jointly displaying Nutri-Scores and Eco-Scores on products. The literature on the effects of dual-labelling is very scarce (De Bauw et al. 2021; Osman and Thornton 2019). However, there is evidence that a combined Nutri-Score & Eco-Score improves nutritional values of food choices, but hardly affects the environmental impact of those (De Bauw et al. 2021). On the one hand, sustainability information remains less important for consumer decisions, in contrast to taste as most important driver (Buhrau and Ozturk 2018; Honkanen and Frewer 2009; Kourouniotis et al. 2016; Maehle et al. 2015). On the other hand, due to halo-effects, sustainability information could simultaneously affect the health perception of products (Grunert 2005). Being aware of these interactions between both scores, the goal of this study is to provide insights on the effectiveness of displaying both scores simultaneously, which is now increasingly done in the market.

A substantial part of our food consumption decisions is gradually changing scenery from brick-and-mortar stores to E-grocery stores (Gunday et al., 2020). Apart from a growth in sales volumes through the online channel, a diversification of consumer profiles doing their groceries online has also been observed, with a remarkable growth amongst elder people recently (OECD 2020). In 2019, the share of online food groceries varied amongst EU countries, from 6% and 12% in Italy and Belgium respectively to 32% and 36% in UK and the Netherlands (Eurostat, 2020). The recent COVID-19 pandemic is most likely an accelerator of this growth. Online food decision processes are typically more reflective than decisions made in physical stores, since a large set of sensory appeals and heuristics are being eliminated. This allows E-groceries to focus more on cognitions through education and learning. In addition, E-groceries have the capability to influence food choices by using smart and personalized nudges (Coffino, Udo, and Hormes 2020; Karlsen and Andersen 2019). The growth in E-grocery purchases entails emerging opportunities to face the existing challenges of our food system, related to health- and environmental damage (Blom et al. 2021).

Therefore, the present study aimed to explore the potential of several digital functionalities in an E-grocery environment to stimulate more healthy and pro-environmental food choices.

2. Conceptual approach

As with all human behaviour, healthy- and environmentally friendly food choices are roughly driven by one's motivations, opportunities and ability (MOA) to make such choices (Aschemann-Witzel et al., 2013; Grunert et al., 2014; Rothschild, 1999). Stimulating this behaviour might require improvements in all three dimensions (MOA). A motivated and capable consumer still has to be given the opportunity, as will the opportunity alone not necessarily lead to better choices. Therefore, this study explores several interventions that either aimed to increase motivations, provide opportunities or enable better choices.

First of all, FOP-labels provide consumers the *opportunity* to objectively consider health- and/or environmental information in their food choices. The nutritional content and environmental impact of products are per definition credence attributes, as they cannot directly be observed. From this perspective, Nutri-Scores and Eco-Scores could be seen as opportunities to account for that information. Consumers have been found to perceive products with beneficial Nutri-Scores (Eco-Scores) as healthier (more sustainable) (De Temmerman et al. 2021; Vandevijvere et al. 2020; Weber 2021). Therefore, the present study applies a combined Nutri- and Eco-Score for healthier and more environmentally friendly food choices. Providing this opportunity does however not necessarily lead to its usage. As described by dual-process theories, like the Elaboration Likelihood Model (ELM), the extent of information searching and processing strongly depends on consumers' motivations and ability (Petty and Cacioppo 1986).

Secondly, consumers' *motivations* to consider health- and/or environmental information in their food choices are often driven by a more general interest in healthy and/or or sustainable living (Dean et al. 2012; Van Loo, Hoefkens, and Verbeke 2017; Wardle and Steptoe 1991). Increasing those motivations therefore remains a major challenge (Hung et al. 2017). In general, motivations to look for certain information depends on individually anticipated values of that information (Sharot and Sunstein 2020). Increasing the perceived personal relevance of health/environmental information can raise those anticipated values and lead to higher motivations amongst consumers to actively search for it and use it. A practical way to make health/environmental information more relevant, is by providing personalized feedback on past behaviour and by explicitly comparing this feedback to peers. Both the provision of feedback and social norms have been widely described in the literature as very effective nudges to steer behaviour (Sunstein 2014). This has also particularly been found in the context of food consumption (Celis-Morales et al., 2017; Czajkowski et al., 2019; Higgs et al., 2019; Johannes et al., 1999; Vermeir & Verbeke, 2006). Given the proven success of these nudges, this study questions whether real-time average basket impacts, be it compared to those of peers or not, could motivate health- and environmental considerations in food choices in E-groceries. The use of such dynamic cues is one of the features that E-groceries can easily accommodate.

Thirdly, consumers' *ability* to make more healthy and environmentally friendly food choices based on FOP-labels depends on their ability to process information. This ability is usually considered as an inherent characteristic of the individual, linked to knowledge and skills (Lähteenmäki 2013; Moorman and Matulich 1993; Petty, Barden, J., and Wheeler 2009). However, it could be argued that due to the highly interpretative format of Nutri-Score and Eco-Score, the role of knowledge and skills becomes relatively less important (Egnell et al. 2018). In contrast, the ability to consider both scores (Nutri- & Eco) to make informed choices remains hampered by an overload of information and a limited amount of time willing to spend in the food environment. Therefore, a more enabling food environment could be an effective way to improve food choices. A functionality which is extensively being used to reduce complexity in e-commerce environments are recommendation agents. Recommendation agents are defined as *"Software agents that elicit the interests or preferences of individual users for products […] and make recommendations accordingly"* (Xiao and Benbasat 2007, p. 137). Their ability to influence consumers' behaviour and purchase intentions has been supported by scientific studies and is being widely exploited by online retailers (Breugelmans et al. 2012; Häubl and Murray 2003; Punj and Moore 2007; Xiao and Benbasat 2007). Only recently has the inclusion of nutritional criteria into the matching algorithms between preferences and recommended products received more attention (Gunaratne and Nov 2017; Ngoc et al. 2018). However, literature covering empirical user testing remains very scarce and focusses only on nutritional indicators while also from an environmental viewpoint there is a strong need for such facilitating strategies (Trattner and Elsweiler 2017).

Based on this conceptual background, the following hypotheses were put forward:

- **H1:** Nutri- and Eco-Scores at product level improve nutritional values of food choices more than environmental impacts
- **H2:** Supporting these scores with personalized feedback and social norm increases their effectiveness
- **H3:** Facilitating food environment with RA's increases effectiveness of scores, personalized feedback and social norm

3. Methods

A randomized control trial was conducted in a mock-up E-grocery. A representative sample of Belgian consumers (n = 1000) selected food products for one meal for their daily household. As in real E-groceries, this selection process was subdivided in two stages. Consumers apply different decision strategies in different phases of product choice (Gilbride and Allenby 2004). Therefore, two focus groups preceded this study to get insights in which phase the nudges would be most favoured by consumers. This has led to a design in which, in the first stage, participants selected food products from a longlist, while the presence of Nutri-Scores and Eco-Scores was manipulated. In a second stage, the initial selections were verified and could be adjusted. During this second stage, the presence of recommendation agents, product scores, impact scores of the food basket and social norm were manipulated. Consumers' selected food baskets were recorded at the end of both stages. Treatment effects were evaluated based on the (shift in) overall nutritional quality and environmental impact of the selected baskets between stages. A more detailed description of individual elements in this approach is given below.

3.1. Participants

The experiment was conducted in November 2019 in Flanders (the northern half of Belgium), with a representative sample of 1000 consumers (Table 1). Participants were recruited by a subcontracted market research agency and were randomly assigned to one of the experimental cells, adding up to 125 participants per cell. The target population were Dutch speaking Flemish adults, being household food decision makers. People working in market research, marketing, advertising or in the food sector in general were excluded to prevent demand effects. The experiment was single blinded: respondents were not informed on the exact aim of the research in order to prevent any self-selection and/or forewarning bias. A financial reward was provided after participation but no real payment for the food products was required after the shopping task and products were not actually delivered either. The study was ethically approved by SMEC, host institute of the principal investigator (reference code: **G- 2018 11 1425**). All participants signed an informed consent and complete anonymity was guaranteed. After the removal of observations with extremely implausible consumption quantities, the final sample contained 994 respondents of which the socio-demographic characteristics are given in Appendix D (Table D.1). The sample was roughly representative for the Belgian population in terms of gender and age while being slightly overrepresented by respondents from higher income and educational classes. None of the treatment groups were significantly over- or underrepresented by particular gender, age or educational classes (Table D.2 – D4).

3.2. Manipulations

The first factor included the provision of several layers of information and featured four levels: *(1)* a control level without additional information, *(2)* Product Scores (PS), *(3)* Product Scores and Basket Scores (PS & BS), *(4)* Product Scores and Basket Scores and Social Norm (PS & BS & SN). The individual layers are described below.

- *Product Scores (PS)* Both Eco-Scores (top-left) and Nutri-Scores (top-right) were displayed on every product tile. These products scores were tested both in stage 1 and stage 2 (Appendix A Fig

A.1 & Fig A.2). The product scores used in this experiment were based on standard calculation methodologies for Nutri-Score and PEF (Chantal and Hercberg 2017; European Commission 2019; FPS 2019). Seemingly identical products, differing only in terms of a score were provided with some extra information that could explain the difference in scores. An overview of the included products and corresponding scores are reported in Table B.1 in Appendix B.

- *Basket Scores (BS)* A total Nutri- and Eco-Score of the selected basket was displayed in the top-right corner (Fig A.2). The basket scores were only tested in stage 2 of the experiment. These scores at basket level were instantly recalculated with every adjustment and were expressed both as 5-level scores (A-E) and as numeric values between 0 and 100. In the latter expression, 0 corresponded to the lowest possible environmental impact or the best nutritional quality and 100 to the highest possible impact or the poorest nutritional quality. The calculation and cut-off values, used to obtain these basket scores, are reported in Appendix C.
- *Social Norm (SN)* A descriptive social norm on average basket scores was displayed (Fig A.2). This treatment was only tested in stage two. Respondents were informed about the scores of consumers of the same age, gender and province. It was stated that: *"In (***province***), most (***gender***) between (***age segment***) have an average Nutri-Score of 35% and an Eco-Score of 25%."* Depending on respondent's socio-demographic data, this message was tailored in such a way that it matched their profile. The average values of 35 and 25 were the same for all respondents because such specific information was not available before conducting the experiment. The values of 35 (Nutri) and 25 (Eco) corresponded to average baskets in terms of nutritional quality and environmental impact, based on repeated plausible product selections. This provided a range of realistic scores and the scores 35% and 25% were rather a the lower end of the range. This was done on purpose, to induce a norm that could encourage respondents with average and poor scores to improve. Respondents who already had good scores were expected to be less or unaffected by this norm.

The second factor included the suggestion of healthier and/ or more environmentally friendly alternatives with recommendation agents (RAs) (Fig A.3). Two levels were featured (with RA's vs without RAs). RA's were only tested in stage 2 of the experiment. Products having alternatives with better Nutri-score and/or Eco-score were equipped with a button to *"Improve your scores"*. If no scores were displayed, this button said "Improve your basket" to avoid confusion. Once a respondent clicked this button, up to three comparable products with better nutritional quality or lower environmental impact, were suggested next to the originally selected product. Suggested alternatives had a better Nutri-score or Eco-score (or both) but never a worse score. This avoided trade-offs between nutrition and environmental sustainability. Without recommendation agents, respondents were still able to make adjustments in their selection but only by reducing or increasing quantities of already selected products. Two levels were tested: with RA's (treatment) and without (control).

3.3. Experimental design

The experiment entailed between-subject manipulations in a two-stage factorial RCT. Throughout the first stage, some respondents were exposed to PS (n = 750), while others were not (n = 250). In the second stage, respondents were exposed to one of the eight factor level combinations defined by a 2 x 4 design [2 (*RAs*: present vs not) x 4 (*Information layer*: Control, PS, PS & BS, PS & BS & SN)]. If a respondent was exposed to PS in the first stage, these also appeared in the second stage and vice versa.

The basket scores were calculated based on the product scores and the social norm compared the basket score of the participant to the average basket score of its peers. The information captured by the social norm thus builds on the basket score which in turn is determined by the product scores. Hence, only additive effects could be considered. Meaningless combinations, like the combination of the average basket score without product scores or the combination of the social norm without the average basket scores were precluded. This led to one 4-level factor instead of three 2-level factors. Contrastingly, the RA's could be manipulated independently of the level of information. As a consequence, the overarching 2 x 4 design in Fig. 1was obtained

The wireframes used to develop the simulated E-grocery were provided by a large Belgian retailer, involved as partner in this study. In which of the two stages the functionalities were tested was decided based on multiple co-creation sessions with consumers. They expressed a strong aversion of additional information cues or recommendations during the selection of products, while they were rather open for interventions assisting the verification of their selected basket. A comprehensive description of these co-creation sessions falls beyond the scope of this paper. Although such positioning of the different nudges across both stages appeared to be most preferred by consumers, this design does not allow for assessing effects of the nudges independent of stage.

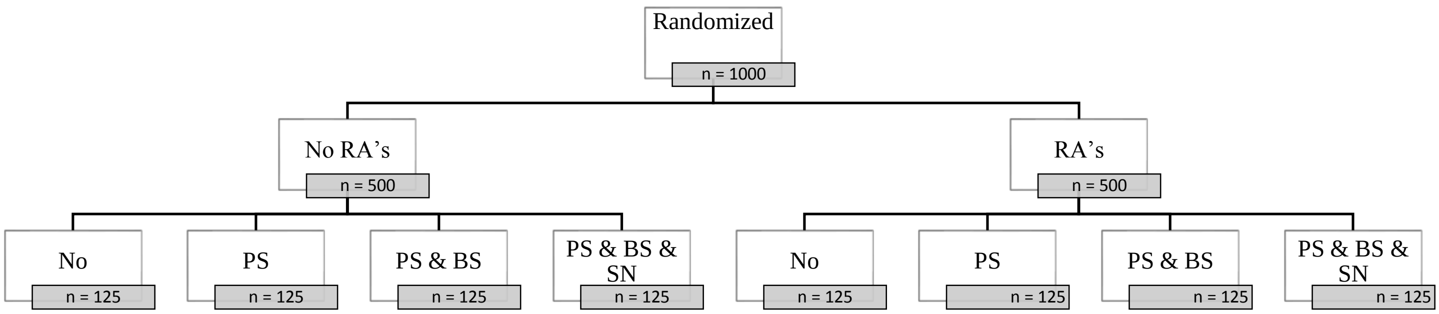

Figure 1: Overarching experimental design. Respondents were randomly assigned to a treatment group. Treatment groups were characterized by combinations of recommendation agents (RA), product scores (PS), basket scores (BS) and social norm (SN).

3.4. Experimental procedure

Briefing: Before starting the experiment, respondents were requested to imagine themselves doing food purchases for one meal for their daily household, and to select food products accordingly. After this explanation, they were notified about the possible occurrence of Nutri- and Eco-Scores and the meaning of these were explained very briefly. As the task was stated to be hypothetical, cheap talk scripts were applied. Participants were told about highly encouraged once more to imagine themselves doing real purchases and to behave as close to reality as possible.

Experiment stage 1: Subsequently, respondents were directed to a simulated E-grocery from which they could choose their preferred food products and quantities. As in real E-groceries, the selection process was subdivided in two main stages. The first stage included the selection of products from a longlist of food products (Fig A1 & Table B.1). The inclusion of products in this list started for each product from a reference product. Case by case, a slight variation to the reference product was then specified. Products could alter in different aspects, resulting in different scores (e.g. production method, certificate, origin, reduced calories, sugars, etc.). Compared to the reference product, only one aspect was varied for each alternative to avoid that the alternative has for example a better Nutri-Score, but a worse Eco-Score. 17 product pairs (consisting of a reference product and alternative product) were shown. Of the 17 pairs, three were different in Nutri-Score and 14 in Eco-Score. This imbalance was intentionally set because environmental impacts within-products typically vary much more widely than for nutritional values. A perfectly paired set of products was considered unrealistic and therefore, next to 17 product pairs (34 products in total), six single products were added. As such a total of 40 products were shown to the participants. Price levels (low, average, high) were randomly rotated between similar alternatives to avoid lower/higher impacts corresponding systematically to higher/lower prices[1]. To avoid order effects, we ensured that products with better scores did not systematically appear earlier on the screen than those with poorer scores or vice versa. Products were selected by using "+" and "–" buttons, which operated per piece or per gram depending on the product type. Once finished, respondents were asked to confirm their initial selection and were led to the second stage. At this point, the selected basket was recorded a first time.

Experiment stage 2: Thereafter, respondents were led to an overview of their selection and had the opportunity to make adjustments by removing products or changing quantities (Appendix A Fig A.2 & A.3). All participants had the opportunity to alter their product choices. However, this process was encouraged and/or facilitated by means of the functionalities described earlier. After verifying baskets, another confirmation was asked and selections were recorded a second time.

Follow-up: Eventually, in a brief follow-up survey, respondents were asked to what extent they (1) considered Nutri-Score (Eco-Score) in their choices and (2) to what extent they were willing to see a Nutri-Score (Eco-Score) in their food environment (both 6 point Likert scales). These variables served as a proxy for the attention paid to the scores during the task and for their anticipated values respectively. Furthermore, questions on dietary habits, food related motivations and socio-demographic information were filled out.

[1]This justifies not further considering price effects, while these are certainly important attributes in food consumption.

3.5. Data

The average nutritional quality and environmental impact per person were considered as main outcome variables of interest. For both variables, an index was calculated as the weighted sum of all food products' scores per person. For the nutritional quality index (NQI), an energy-weighted sum was used (Eq 1). A lower NQI corresponds to a better nutritional quality. The NQI could be negative or positive and is dimensionless. For the environmental impact index (EII), a mass-weighted sum was used (Eq 2). This index was strictly positive and also dimensionless. A higher environmental impact index corresponds to a higher environmental impact. To calculate the index per household member for every respondents, the weighted sums were divided by household size.

$$Nutritional\ quality\ index\ (NQI) = \frac{\frac{\sum Nutri{-}Score_i * (kJ\ of\ product\ selected)_i}{\sum (kJ\ of\ product\ selected)_i}}{HHSize} \qquad \text{Equation 1}$$

$$Environmental\ impact\ index\ (EII) = \frac{\frac{\sum Eco{-}Score_i * (kg\ of\ product\ selected)_i}{\sum (kg\ of\ product\ selected)_i}}{HHSize} \qquad \text{Equation 2}$$

To evaluate shifting behaviour in the second stage, difference-in-differences were considered: differences in NQI and EII between measurement 1 and 2 were compared across different treatments (Eq. 3 & Eq4). These indices reflect how much shifting has occurred in the basket screen.

$$\Delta NQI = (NQI)_{Measurement\ 2} - (NQI)_{Measurement\ 1} \qquad \text{Equation 3}$$

$$\Delta EII = (EII)_{Measurement\ 2} - (EII)_{Measurement\ 1} \qquad \text{Equation 4}$$

The statistical analysis was performed using Stata 15. Based on $\chi 2$ – association tests, the balance in age, gender and educational levels between the 8 different treatment groups was evaluated. To evaluate the effects of products scores on NQI and EII after the first stage, independent sample t-test were used, preceded by a Levene's test to verify the assumption of variance equality. To evaluate the effects of the four treatments on ΔNQI and ΔEII in the second stage, two-way ANOVA models were followed by planned contrasts. [2]

[2] Under the central limit theorem, the use of two-way ANOVA's was considered justified. However, since no changes at all during stage 2 were very likely to occur (ΔNQI=0 & ΔEII=0), the emergence of a strongly leptokurtic distribution was expected.

4. Results

4.1 Stage 1: Initial product selection

During the initial selection of products, participants were exposed to the *product scores* (n=745) vs *not* (n = 249). Total NQI's and EII's of this initial selection are shown in Fig 2 and Fig 3 respectively.

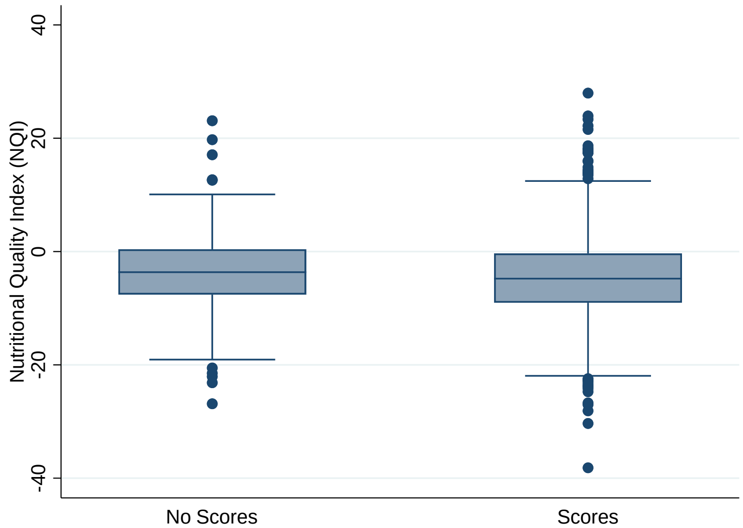

Figure 2: NQI after stage 1 with and without product scores

In terms of NQI, participants being shown Nutri- and Eco-Scores (*M* = -4.54, *SD* = 2.7) made significantly better selections than those were not (*M* = -3.41, *SD* = 6.92), t(493.63) = 2.12, p = .03 *(unequal variances assumed)*.

Therefore, in addition to the two-way ANOVA's, we validated the results by a non-parametric Kruskal-Wallis H-tests followed by post-hoc Mann-Whitney tests where possible.

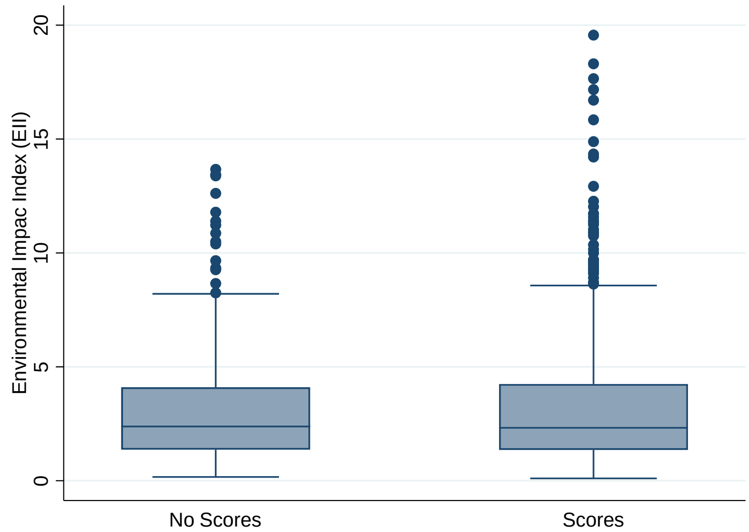

Figure 3: EII after stage 1 with and without product scores

Contrastingly, in terms of EII, participants exposed to the scores (*M* = 3.22, *SD* = 2.81) did not differ from those who did not (*M* = 3.17, SD = 2.67), t(992) = 0.21 p = 0.83 *(equal variances assumed)*.

4.2 Stage 2: Shifting behaviour in basket screen

4.2.1 Shift in Nutritional Quality Indicator (ΔNQI)

Differences in NQI between the second and the first measurement (ΔNQI) were considered to study healthy shifting behaviour in the basket overview screen. Table 1 and Figure 4 show ΔNQI per experimental cell. Individually, none of the experimental cells showed significant changes in NQI, as ΔNQI did not differ statistically from zero. A two-way ANOVA revealed no significant main effects of RA's (F(1,986) = 2.47, p = 0.11) and information levels (F(3,986) = 0.03, p = 0.99) on ΔNQI and the interaction effect was insignificant as well (F(3,986) = 1.07, p = 0.36)[3].

[3] A non-parametric Kruskal-Wallis H-test confirmed that ΔNQI was not significantly affected by the eight treatment groups (H(7) = 4.762, p = .69). This also held when considering RA's or level of information provision as grouping variables (H(1) = 0.572, p = .45 and H(3) = 0.610, p = .89 respectively).

Table 1: ΔNQ per treatment group. Means (standard deviations) are reported with and without recommendation agents per level of information. Cells significantly different from 0 are flagged with (*) if p < 0.05, (**) p if < 0.01 or (***) if p < 0.001

	without RAs	***n***	**with RAs**	***n***
No information	0.019 (0.845)	*124*	-0.056 (1.636)	*125*
Product Scores	-0.058 (1.194)	*125*	-0.000 (0.469)	*123*
Product Scores – Basket Scores	0.041 (1.458)	*123*	-0.116 (1.376)	*125*
Product Scores – Basket Scores - Social norm	0.178(1.641)	*124*	-0.189 (1.708)	*125*

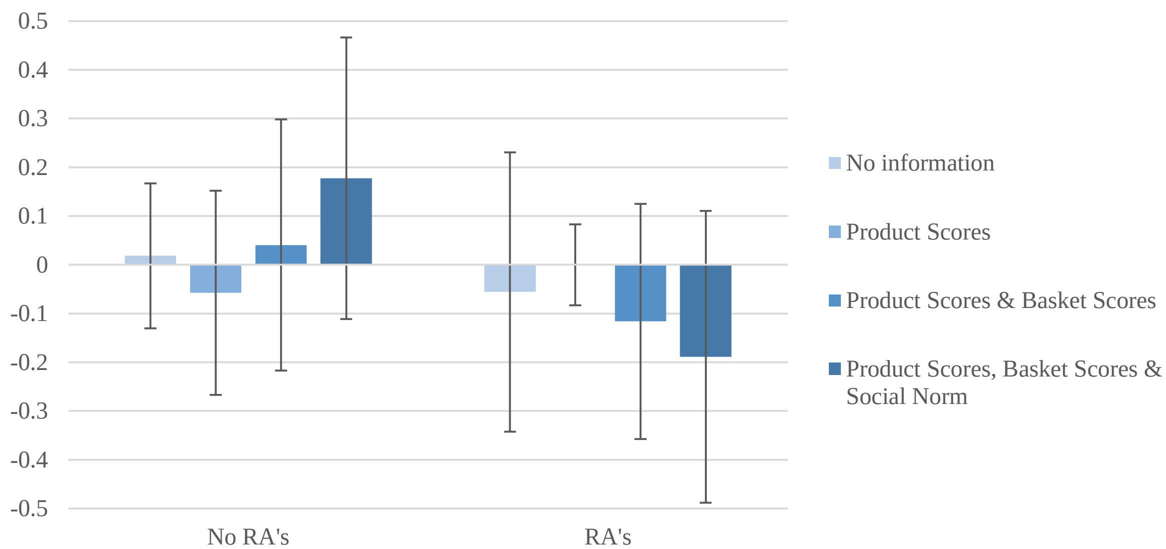

Figure 4: Mean ΔNQI per treatment group with 95% confidence interval

4.2.2 Shift in Environmental Impact Indicator (ΔEII)

Differences in EII between the second and the first measurement (ΔEII) were considered to evaluate environmentally friendly shifting behaviour in stage 2. Table 2 and Figure 5 show mean ΔEII's per experimental cell. Negative values correspond to improvements, positive values to deteriorations. In absolute terms, only in the experimental cell with RA's and PS & BS & SN, desired shifting behaviour towards lower environmental impacts was observed. However, comparisons should be made with control conditions to draw conclusions on effects. A two-way ANOVA revealed a significant main effect of RA's ($F(1,986) = 4.46$, $p = 0.04$) and a significant interaction effect between RAs and the level of information

(F(3,986) = 2.59, p = 0.05). The main effect of information layer was insignificant (F(3,986) = 1.93, p = 0.12)[4].

On average, treatments with RA's led to greater reductions in environmental impact than those without RA's. Furthermore, the RA's also influenced the effect of the informational treatments (Fig 5). Without RA's, the average ΔEII did not differ significantly across levels of provided information. With RA's, the conditions with PS, PS & BS and PS & BS & SN all showed significantly better shifting behaviour than the control condition without information (respectively t(246) = 1.91, p = 0.03; t(242.1) = 2.11, p = 0.02 and t(157.1) = 2.46, p = 0.007). The impact of these three levels did not differ significantly from each other. With RAs, product scores led to significantly improved ΔEII's compared to no information (t(246) = 1.91, p = 0.03). However, the addition of basket scores to the product scores had no effect (t(246) = 0.08, p = 0.9) neither did the addition of social norm to product- & basket scores (t(148.3) = -1.2, p = 0.12).

Alternatively, the influence of RA's also depended on the level of information (Fig 5). Follow-up contrasts demonstrated that RA's only led to improvements in combination with PS & BS & SN (t(247) = 2.12 , p = 0.018). Without information, with only PS and with PS & BS, the RA's had no effect (respectively t(214.12) = -1.51, p = 0.13; t(149.68) = 1.57 , p = 0.11 and t(217.50) = 1.38, p = 0.17).

Table 4: Difference in environmental index between second and first measurement. Means (standard deviations) are reported. Cells significantly different from 0 are flagged with (*) p < 0.05, (**) p < 0.01 or (***) p < 0.001

	without RAs	***n***	**with RAs**	***n***
No information	-0.047 (0.561)	124	0.045(0.374)	125
Product Scores	0.122 (1.126)	125	-0.045 (0.362)	123
Product Scores – Basket Scores	0.021 (0.459)	123	-0.048 (0.320)	125
Product Scores – Basket Scores - Social norm	0.004 (0.190)	124	-0.193 (1.015) *******	125

[4] Since these results entail a significant interaction, a non-parametric test could not be used to validate the findings.

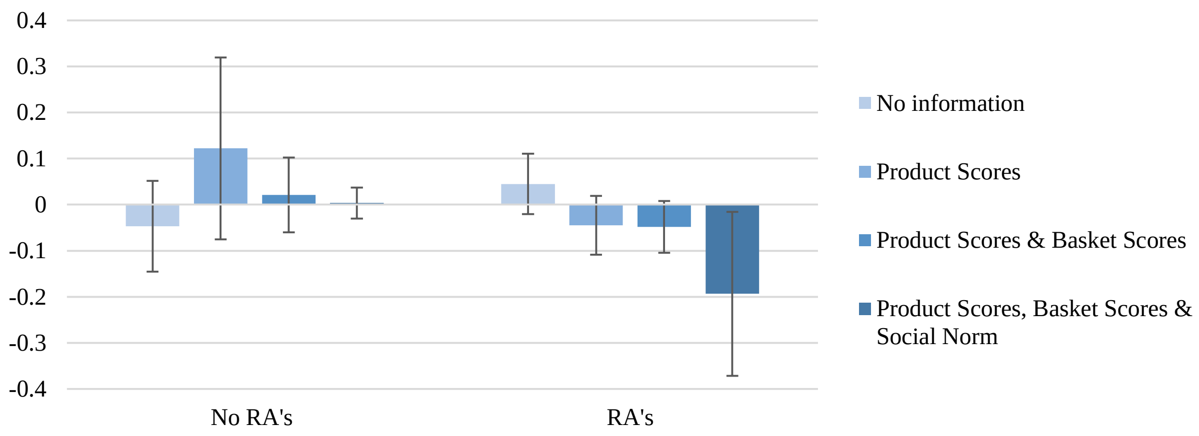

Figure 5: Average ΔEII per treatment group with 95% confidence interval

4.3 Manipulation checks

Conceptually, it was hypothesized that by using personalized feedback and social norms, the perceived personal relevance of scores would increase. This would increase (1) participants' willingness see the scores as well as (2) the extent to which the scores are accounted for in decision making. To examine whether this mechanism actually took place, proxy-variables were compared across treatments. Following the experiment, these proxy-variables measured to what extent respondents (1) wanted to see Nutri- (Eco-) Scores in the food environment and (2) accounted for these scores during the task, both on 6 point Likert scales.

4.3.1 Willingness to see scores

A one-way ANOVA revealed significant differences in willingness to see Nutri-Scores across the different levels of provided information ($F(3,990) = 2.71$, $p = 0.04$). With PS, the mean willingness to see Nutri-Score (*M* = 4.72, *SD* = 1.70) was significantly higher compared to the control (*M* = 4.29, *SD* = 1.84, p = 0.005). However, for PS & BS (*M* = 4.55, *SD* = 1.56), this difference with the control group was only marginally significant (p = 0.09) and for PS, BS & SN (*M* = 4.48, *SD* = 1.79), this was insignificant (p = 0.20). Opposite to what has been intended with basket scores and social norm, the willingness to see Nutri-Score decreased instead of increased with their addition to product scores.

No significant differences in willingness to see Eco-Scores across different levels of provided information were observed ($F(3,990) = 0.57$, $p = 0.63$).

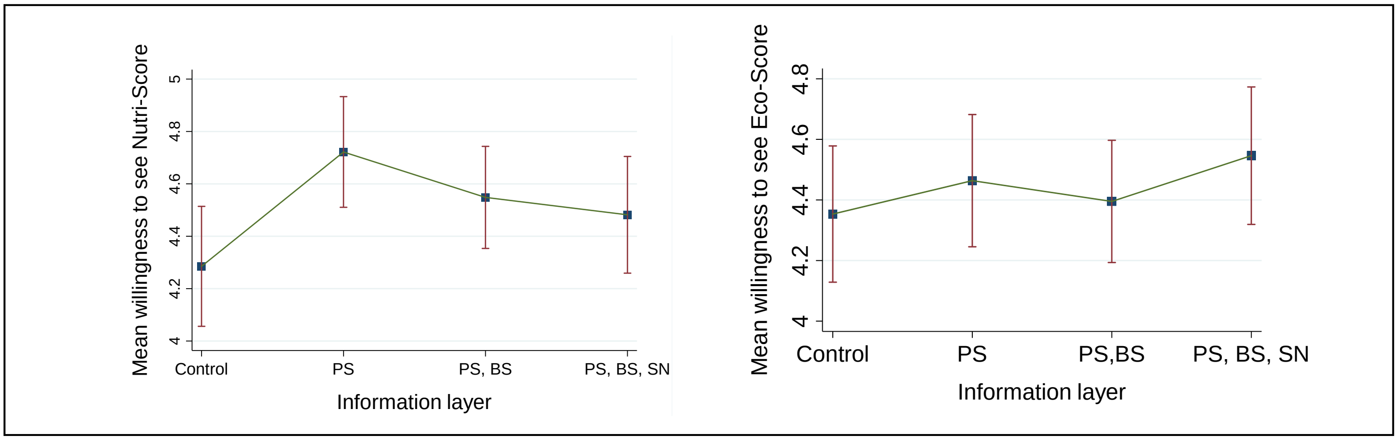

Figure 6: Mean willingness to see Nutri-Score (left) and Eco-Score (right) on a 6 point scale per layer of information: Product Scores (PS), Product Scores and Basket Scores (PS, BS) and Product Scores, Basket Scores and Social Norm (SN)

4.3.2 Stated focus on scores

One-way ANOVA's revealed significant differences in participant's reported reliance on Nutri-Score [Eco-Score] during the task (F(3,990) = 8.52, p = 0.000 [F(3,990) = 4.33, p = 0.005]). Unsurprisingly, a stronger reliance on Nutri-Score [Eco-Score] was reported with PS, (M = 2.9, SD = 1.83 [M = 2.66, SD = 1.53]) than in the control condition (M = 2.34, SD = 1.54; p = 0.000 [M = 2.25, SD = 1.42; p = 0.003]). The same held for PS, BS (M = 2.96, SD = 1.711; p= 0.000 [M = 2.58, SD = 1.51; p = 0.014]) and PS, BS, SN (M = 3.00, SD = 1.78; p = 0.000 [M = 2.68, SD = 1.53; p = 0.001]). However, when comparing PS to PS &BS or to PS & BS & SN, no additional increments in reported reliance on Nutri-Score [Eco-Score] was observed (p = 0.938 and p = 0.835 respectively [p = 0.61 and p = 0.827 respectively]).

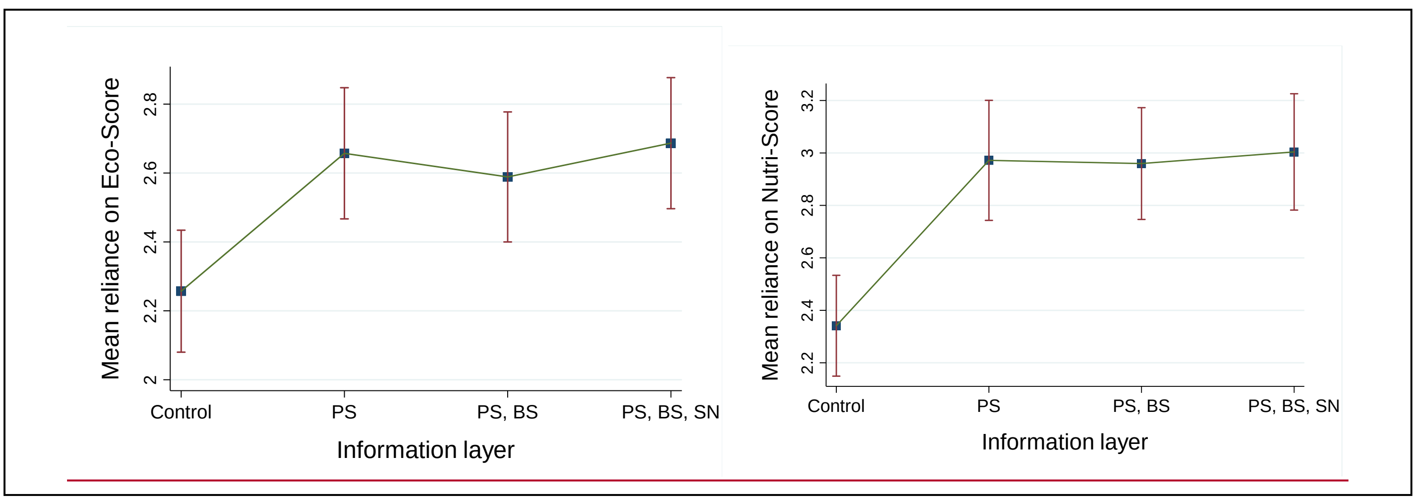

Figure 6: Mean stated reliance on Eco-Score (left) and Nutri-Score (right) during choice task on a 6 point scale per layer of information: Product Scores (PS), Product Scores and Basket Scores (PS, BS) and Product Scores, Basket Scores and Social Norm (SN)

5. Discussion

5.1 Interpretation

In the first stage of the experiment, the effect of a dual scoring system on the NQI and EII of food choices was examined. The findings suggest that displaying Nutri- and Eco-Score at product level led to improved nutritional qualities of food choices, while the environmental impact was not reduced. Respondents being exposed to the scores report to have relied significantly more both on Nutri-Score and on Eco-Scores compared to those who were not. Therefore, this discrepancy could not be explained by stated levels of attention being paid to the scores. Furthermore, the absence of an effect on EII could potentially be explained by halo-effects, although those were not tested. For example, information on sustainability could affect consumers' taste perceptions of products, both in positive and negative ways (Luchs et al. 2010; Napolitano et al. 2007). Due to lack of information on potential mediating variables, the results only allow to attribute the observed effect on NQI to the scores, but not to explain how it took place, neither to explain why no effect on EII was observed.

On the one hand, the findings corroborate the growing body of literature indicating that Nutri-Score would be an effective communication tool for inducing healthier food choices amongst consumers (Egnell et al. 2018; Egnell, Boutron, et al. 2019; Egnell, Talati, et al. 2019; Poquet et al. 2019; Vandevijvere et al. 2020). On the other hand, it confirms recent evidence that jointly displaying Nutri-Score and Eco-Score would improve the NQI of food choices but not the EII (De Bauw et al. 2021). Even with a more prominent visual position given to Eco-Score, the present study came up with the same findings. This suggests that there is something inherent to Eco-Score that makes it less activating in the product screen than the Nutri-Score. One the one hand, this could relate to the fact that respondents might have been familiar with the Nutri-Score while this is was impossible for the Eco-Score as the experiment was conducted in 2019, before Eco-Scores were introduced by retailers. On the other hand, consumers' overall relatively low importance attached to environmental aspects in food consumption might have been driving this (Maehle et al. 2015). Simply adding an analogous Eco-Score to the Nutri-Score would, at least in the short term, not be sufficient to reduce the environmental impact of consumers' food choices. However, this does not imply that providing the Eco-Score had no effect at all throughout the experiment.

In the second stage of the experiment, RA's led to shifting behavior associated with a reduced environmental impact. This held, however, only in combination with all other treatments (product scores, basket scores and social norm). Similarly, the conditions with product scores, product scores and basket scores, and product scores, basket scores and social norm did lead to reduced environmental impacts, but only if combined with RA's. In addition, the basket scores and social norm did not lead to additional improvements. This conditionality of effects might be an indication of facilitated informed choices rather than entirely unconscious choice steering. These findings demonstrate the importance of an integrated approach, combining both motivation, opportunity and ability factors to have the highest responses. None of the individual treatments but rather their combinations led to improvements.

Where during the first stage of the experiment only improvements in terms of nutritional quality were observed, improvements only in terms of environmental impact were observed in the second stage. The absence of effects on nutritional qualities in the second step might not surprise. Improvements were already induced in the preceding step and hence there remained less room for improvement in the second stage. These findings could be linked to nutritional values of food being often prioritized over environmental impacts by consumers. However, the finding that environmental improvements, although less prioritized, could be achieved in a later stage of the purchase process are promising. By applying different interventions across the consumers' decision process, it might become possible to bring less prioritized considerations into play nonetheless. However, this is speculative and would need further testing to be validated.

As discussed earlier, the product scores in presence of RA's led to improved ΔEII's. In contrast, the addition of personalized basket scores to the product scores or the addition of a social norm to the product- & basket scores norm did not lead to additional shifting behavior as regards neither the nutritional quality nor the environmental impact. This difference in effects between additional cognitively-oriented nudges (basket scores and social norm) and behavioral-oriented nudges (RAs) accords with the recent meta-review by Cadario and Chandon (2020). With these additional functionalities, attempts were made to improve the perceived personal relevance of nutritional/environmental information. However, considering the willingness to see Nutri- and Eco-Scores did not increase by providing additional cognitively-oriented nudges (basket scores and social norm) compared to the control situation. As this willingness to see Nutri- and Eco-Scores can be seen as a proxy for perceived personal relevance, the attempted effect was not realized. Still, due to lack of further mediator variables, we can only suggest some potential reasons why this was not the case. Though it cannot be tested whether this was due to failed manipulations, or due to a real absence of effect. For the basket scores, it could be argued that the use of percentages, in which 0% corresponded to the best possible score, might have felt contra intuitive. As a result, the respondent may have become confused and decided not to pay any attention to it. The social norm conceivably might have failed in activating the perception of an actual norm as respondents might not have identified sufficiently with the described peers. In addition, the respondent might have had little faith in the veracity of the social norm. We also do not know whether they even looked at and considered the basket score and/or social norm. Since there might be various reasons behind this lack of effect, which could not be tested, these results should not be generalized.

5.2 Implications for policy and industry

First, our results strongly endorse a further expansion of Nutri-Score to a wide range of products for a transition towards more healthy dietary patterns. The more food products are labelled with the score, the more beneficial its prospected effects. Not only is this in line with the accumulating literature on Nutri-Score, but it also demonstrates that the addition of an Eco-Score does not diminish Nutri-Score's effectiveness.

Second, very useful observations were made regarding the point throughout the purchasing process at which effectiveness could be achieved. Nutri-Score could be considered as a full-fledged attribute during food choices, as it instantly led to the selection of a healthier basket. In contrast, Eco-Scores were only found to be effective as an optimization criterion to improve selected baskets. This has implications for retailers who want Eco-Scores to be actually reflected in consumers' food choices. While environmental impacts are generally considered important amongst consumers, this is often overruled by more important characteristics like price, taste or health impact. As it is no top priority, failure to be considered in initial food choices is likely to occur. However, as low environmental impacts are generally considered favorable, introducing this aspect at a later phase of the decision process could still lead to desirable outcomes.

Third and finally, Eco-Score's effectiveness might be conditional. Alterations in the food environment that minimized efforts of shifting behavior were required for the eco-score to actually lower environmental impacts. Therefore, despite the promising advances being made concerning the creation of a uniform labelling system (Nutri-Score & Eco-Score), an enabling food environment (e.g. recommendation agents) should be ensured. Although people are increasingly open to sustainable food choices, it must not take too much effort. Therefore, the crucial next step towards dietary transition should focus on visibility and availability of low-impact products. The example of a recommender system that integrates nutritional and environmental criteria in its algorithms could hereby be used as an example of how widely used digital marketing tools could be used for public health- and sustainability purposes.

5.3 Strengths and limitations

While plenty of research emerged during the last years on the effect of Nutri-Score on consumers' food choices, this study took a step forward and added on the limited literature on a combined Nutri- and Eco-Score approach. On top of that, attempts were made to stimulate the use of both scores by using smart and personalized nudges. We make use of objective outcome measures to measure healthy food choices and environmentally friendly food choices. This study adds to the scarce empirical experiments on the performance of recommendations agents in the light of healthy and sustainable food consumption.

However, this study is also subject to some limitations. First, the data was collected through a web-survey and with every survey one has to be aware about the potential social desirability bias and hypothetical bias. The authors tried to minimize this effect by replicating the E-grocery environment as accurate as possible, rather than explicitly asking how healthy/environmentally friendly they usually consume and by using cheap talks scripts. Even given these efforts, it is plausible that respondents reacted differently to the treatments than would have been the case in a real E-grocery. Second, the experiment was not incentive-based, as respondents were not asked to pay their final basket selection. This may also have biased the results since price is usually much more important factor in food decision than are health and sustainability. Third, the limited amount of mediator variables impede a proper evaluation of the manipulations. Hence, not all observed effects could be attributed to a certain mechanism and it remains unclear whether the absence of effects were indeed due to actually missing effects or rather due to failed manipulations. Eye-tracking would have been extremely useful to limit this shortcoming. Finally, the functionalities introduced in the second stage, i.e. when participants were presented with an overview of their selection and could make adjustment, could not be assessed independent of the decision phase. Future studies could further explore the observed potential of RA's and product scores across different phases of decision making.

6. Conclusions

This study observed healthier and more environmentally friendly food choices due to the display of a combined Nutri- and Eco-Score. Improvements in nutritional values were observed during the initial selection of products. Improvements in environmental impacts were only observed at the later stage of basket verification and only if facilitated with recommendation agents. Therefore, recommendation agents can be considered as an effective tool to enhance the potential of a dual scoring system in reducing environmental impacts of food choices. The potential of such a recommender functionality therefore urgently needs further investigation and application in the context of dietary transition. In contrast, supporting information that sought to increase the personal relevance of the scores did not lead to additional improvements in terms of nutritional quality or environmental impact. The intended increase in personal relevance and thereby increased focus on scores were also not observed but it could not properly be explained why this was the case. The potential of these cognitively oriented nudges, at least in their specific manifestation of this study, could neither be supported nor generally contradicted. This study illustrates how smart interventions on the visibility and proximity of products with better Nutri- and or Eco-Scores in the food environment can still affect food choices, where more cognitively oriented nudges may fail. Once a uniform labelling is in place, these effort reducing strategies could be key to realize dietary transition.

7. Acknowledgement

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8. CRediT author statement

Michiel De Bauw: Conceptualization, Methodology, Software, Formal Analysis, Investigation, Writing – Original Draft, Visualization **Lucia Segovia de la Revilla:** Conceptualization, Methodology, Investigation, review & editing – **Veerle Poppe:** Validation, Supervision, Project administration, Funding acquisition **- Christophe Matthys**: Validation, Writing – review & editing, Funding acquisition - **Liesbet Vranken:** Term; Conceptualization, Methodology, Validation, Data curation, Writing - review & editing, Supervision, Funding acquisition

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Appendix A

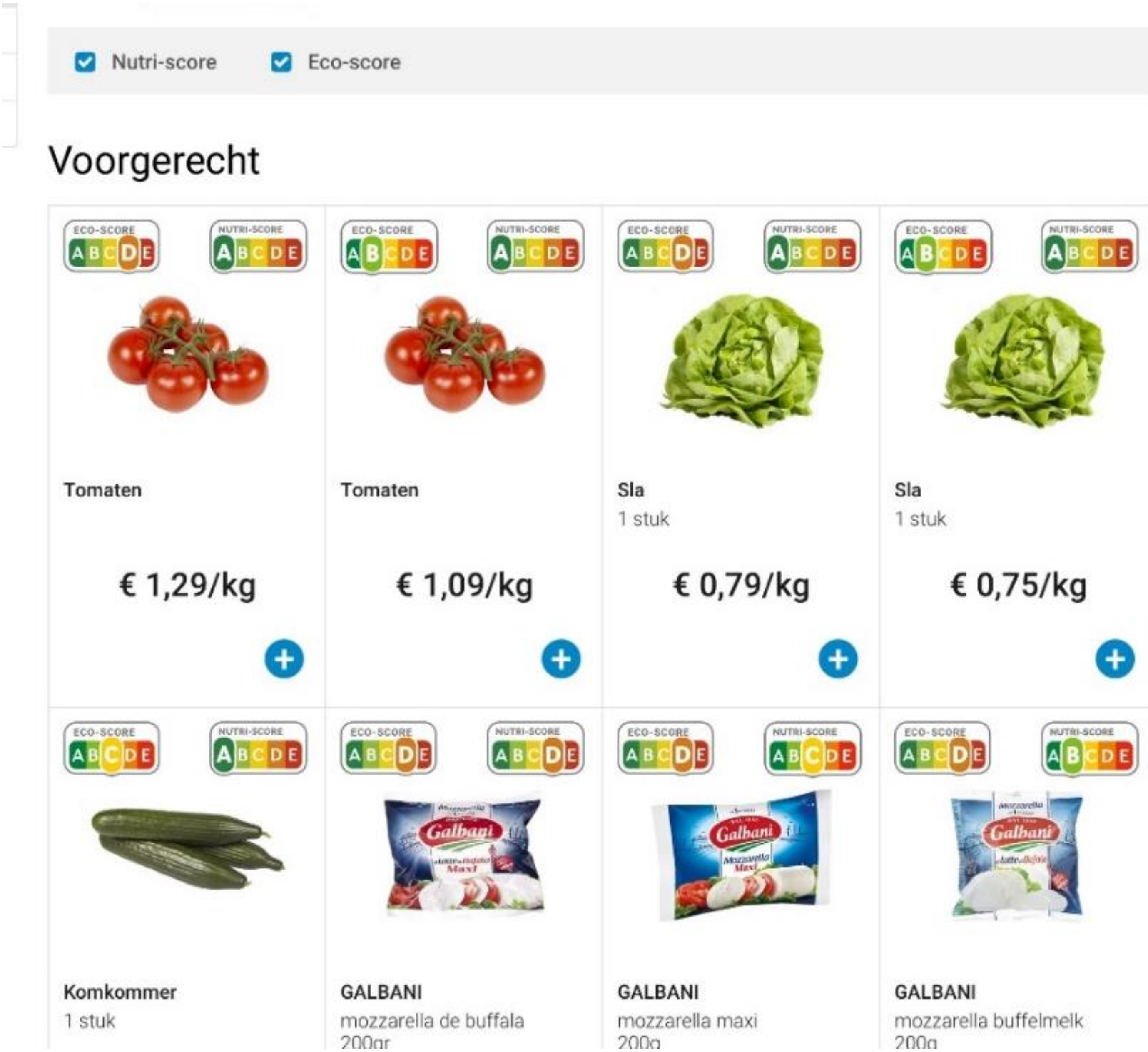

Figure A.1: Wireframe of products with scores in first stage of experiment

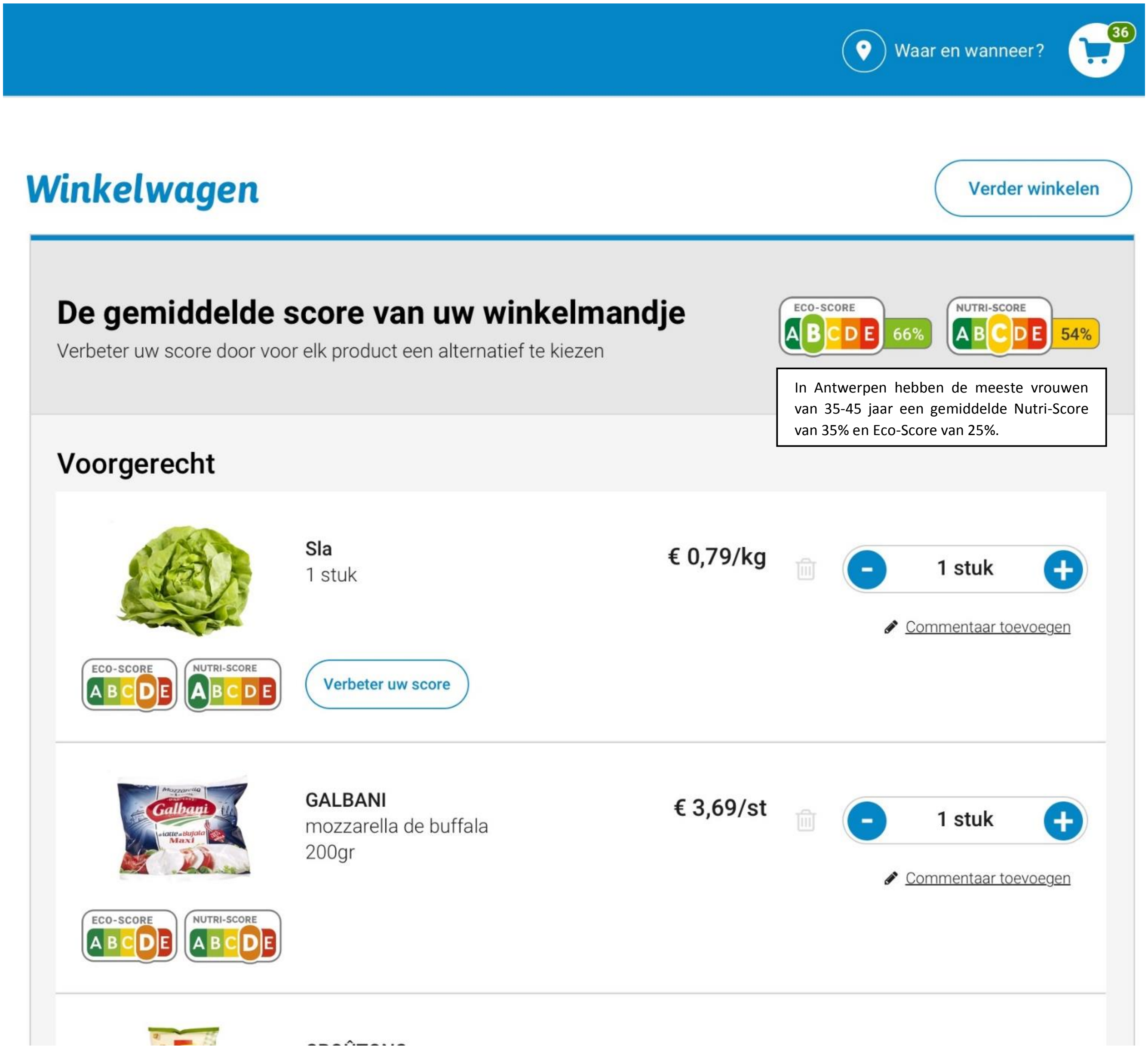

Fig A.2 Wireframe of selected products in stage 2 with product scores, basket scores and social norm

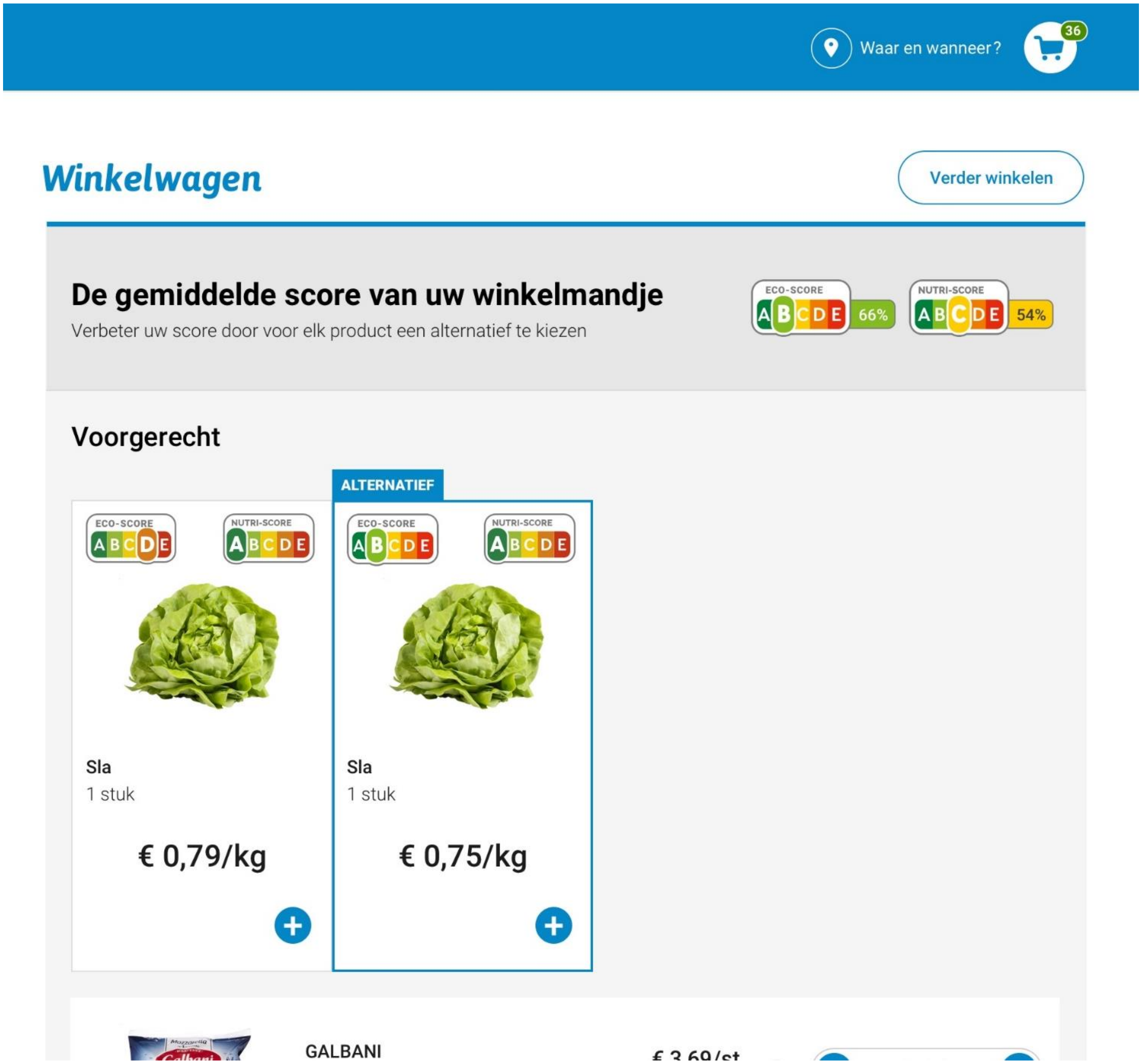

Fig A.3: Wireframe of stage 2 with suggested alternative by RA in blue box

Appendix B

Table B.1

Number	Code	Enviro-Score	Nutri-Score	Product	Extra info	Enviro-Score	Nutri-Score	Energy(kJ)	F.U.	Weight per unit (g)	Price	C
1	TDA01	5.32	-10	Tomato	Origin: Spain	D	A	74	piece	123	€ 1.29/kg	S
2	TBA01	0.9	-10	Tomato	Origin: Belgium	B	A	74	piece	123	€ 1.09/kg	S
3	SDA01	2.38	-8	Lettuce		D	A	58	piece	539	€ 0.79/kg	S
4	SBA01	0.67	-8	Lettuce	greenhouse Flandria	B	A	58	piece	539	€ 0.75/kg	S
5	KCA01	1.9	-5	Cucumber		C	A	65	piece	201	€ 0.69/pc.	S
6	MDD01	2.5	10	Mozzarella	the buffala	D	D	1084	piece	125	€ 3.29/pc.	S
7	MDC01	2.5	11	Mozzarella	maxi	D	C	989	piece	125	€ 2.55/pc.	S
8	CBE01	1.96	22	Bread croutons		B	E	2293	piece	75	€ 1.19/pc.	S
9	PDD01	4.05	18	Prosciutto	di Parma	D	D	1060	piece	90	€ 2.80/pc.	S
10	PCD01	1.84	18	Prosciutto	crudo	C	D	1060	piece	175	€ 3.27/pc.	S
11	TDA02	5.32	-10	Tomato	Origin: Spain	D	A	74	piece	123	€ 1.29/kg	M
12	TBA02	0.9	-10	Tomato	Origin: Belgium	B	A	74	piece	123	€ 1.09/kg	M
13	PDA02	5.32	-7	Passata		D	A	145	piece	690	€ 1.39/pc.	M
14	PBA02	0.9	-7	Passata	BIO	B	A	145	piece	700	€ 0.85/pc.	M
15	PDC02	5.32	3	Pasta sauce	Miracoli Italiano	D	C	209	piece	500	€ 3.65/pc.	M
16	PBC02	0.9	3	Pasta sauce	BIO	B	C	209	piece	500	€ 3.80/pc.	M
17	MBA02	0.57	-5	Mushrooms		B	A	104	piece	500	€ 1.49/pc.	M
18	ZCA02	1.9	-6	Zucchini		C	A	70	piece	320	€ 0.99/kg	M
19	CBA02	1.1	-8	Carrots		B	A	166	piece	61	€ 0.89/kg	M
20	VDA02	4.39	-8	Vegetarian minced meat	from soy	D	A	485	gram	.	€ 8.11/kg	M
21	VBA02	0.9	-8	Vegetarian minced meat	from Quorn	B	A	485	gram	.	€ 12/kg	M
22	CDB02	2.01	2	Chicken mince		D	B	605	gram	.	€ 7.18/kg	M
23	CCB02	1.96	2	Chicken mince	BIO	C	B	605	gram	.	€ 7.60/kg	M
24	PDD02	4.05	13	Minced pork	Origin: Poland	D	D	848	gram	.	€ 7.50/kg	M
25	PCD02	1.84	13	Minced pork	Origin: Belgium	C	D	848	gram	.	€ 7.20/kg	M
26	BEB02	30.12	2	Minced Beef	Soy fed	E	B	843	gram	.	€ 14.45/kg	M
27	BDB02	16,00	2	Minced Beef	Grass fed	D	B	843	gram	.	€14.90/kg	M
28	BED02	30.12	14	Minced pork and beef	Soy fed	E	D	911	gram	.	€ 7.58/kg	M
29	BDD02	16,00	14	Minced pork and beef	Grass fed	D	D	911	gram	.	€7.95/kg	M
30	BDE02	4.05	21	Bacon	Origin: America	D	E	1133	piece	200	€ 2.04/pc.	M
31	BCE02	1.84	21	Bacon	Origin: France	C	E	1133	piece	200	€ 2.04/pc.	M
32	SBA02	1.43	-5	Spaghetti		B	A	1567	piece	500	€ 0.49/pc.	M
33	SWBA02	1.43	-6	Spaghetti		B	A	1446	piece	250	€ 0.49/pc.	M
34	GDD02	2.5	12	Grated Cheese		D	D	1185	piece	250	€ 1.99/pc.	M
35	GDC02	2.5	10	Grated Cheese	LIGHT	D	C	1657	piece	250	€ 3.73/pc.	M
36	TBD03	0.41	13	Tiramisu		B	D	1049	piece	500	€ 3.75/pc.	I

37	ODA03	4,00	-7	Orange	Origin: South Africa	D	A	207	piece	131	€ 1.49/kg	I
38	OBA03	0.95	-7	Orange	Origin: Spain	B	A	207	piece	131	€ 1.33/kg	I
39	YBC03	0.41	3	Yoghurt	Strawberry	B	C	396	piece	200	€ 0.79/pc.	I
40	YBA03	0.41	-2	Yogurt	Skimmed	B	A	140	piece	200	€ 0.46/pc.	I

Table B.2

Table B.1: Suggested alternatives. Grey product is best alternative of the two and was offered when the other was selected

Code	Product	Enviro-Score	Nutri- Score	Alternative
TDA01	Tomato	D	A	1
TBA01	Tomato	B	A	2
SDA01	Lettuce	D	A	1
SBA01	Lettuce	B	A	2
KCA01	Cucumber	C	A	1
MDD01	Mozzarella	D	D	1
MDC01	Mozzarella	D	C	2
CBE01	Bread croutons	B	E	1
PDD01	Prosciutto	D	D	1
PCD01	Prosciutto	C	D	2
TDA02	Tomatoes	D	A	1
TBA02	Tomatoes	B	A	2
PDA02	Passata	D	A	1
PBA02	Passata	B	A	2
PDC02	Pasta sauce	D	C	1
PBC02	Pasta sauce	B	C	2
MBA02	Mushrooms	B	A	1
ZCA02	Zuccinni	C	A	1
CBA02	Carrots	B	A	1
VDA02	Vegetarian meat	D	A	1
VBA02	Vegetarian meat	B	A	2

Table C.2 ctd: Suggested alternatives. If grey product was selected, products below were offered as alternative

Code	Product	Enviro-Score	Nutri- Score	Alternative
BED02	Beef and pork meat	E	D	1
BDD02	Beef and pork meat	D	D	2
CCB02	Chicken meat	C	B	2
VBA02	Vegetarian meat	B	A	2
BDD02	Beef and pork meat	D	D	2
BDB02	Beef meat	D	B	2
PCD02	Pork meat	C	D	2
VBA02	Vegetarian meat	B	A	2
BEB02	Beef meat	E	B	1
BDB02	Beef meat	D	B	2
CCB02	Chicken meat	C	B	2
VBA02	Vegetarian meat	B	A	2
BDB02	Beef meat	D	B	2
CCB02	Chicken meat	C	B	2
VBA02	Vegetarian meat	B	A	2
PDD02	Pork meat	D	D	1
PCD02	Pork meat	C	D	2
CCB02	Chicken meat	C	B	2
VBA02	Vegetarian meat	B	A	2
PCD02	Pork meat	C	D	2
CCB02	Chicken meat	C	B	2
VBA02	Vegetarian meat	B	A	2
CDB02	Chicken meat	D	B	1
CCB02	Chicken meat	C	B	2
VBA02	Vegetarian meat	B	A	2
CCB02	Chicken meat	B	C	2
VBA02	Vegetarian meat	A	B	2
BDE02	Bacon	D	E	1
BCE02	Bacon	C	E	2
CCB02	Chicken meat	C	B	2
VBA02	Vegetarian meat	B	A	2
BCE02	Bacon	C	E	2
CCB02	Chicken meat	C	B	2
VBA02	Vegetarian meat	B	A	2
PCD02	Pork meat	C	D	2

Appendix C

$$Nutri-Score\ Basket\ = \frac{\sum Nutri\text{-}Score\ product \times Energy\ product}{Energy\ basket} \qquad \textbf{Equation C.1}$$

$$Energy\ product = \frac{Energy(kJ)x\ quantity\ product}{100} \qquad \textbf{Equation C.2}$$

$$Nutri-Score\ Basket\ (\%) = \frac{100*(Nutri\text{-}Score\ Basket+15)}{37} \qquad \textbf{Equation C.3}$$

Table C.1: Cut-off values basket Nutri-Scores

Nutritional impact		
Letter		**Nutri-Score basket**
A	<	3
B	≥	41
C	≥	49
D	≥	70
E	≥	92

$$Eco-Score\ basket = \frac{\sum Eco\text{-}Score\ product\ x\ quantity\ product}{Quantity\ basket} \qquad \textbf{Equation C.4}$$

$$Eco-Score\ Basket\ (\%) = \frac{20*(\text{Eco}-\text{Score basket}-\text{UpLevel})}{(\text{UpLevel}-\text{LowLevel})) + \text{UpLevelRescale}} \qquad \textbf{Equation C.5}$$

Table C.2: Cut-off values basket Eco-Scores

Environmental impact				
Letter	**LowLevel**	**UpLevel**	**ReScaleLowLevel**	**ReScaleUpLevel**
A	0	0,4	0	20
B	0,4	1,45	20	40
C	1,45	2	40	60
D	2	10	60	80
E	10	30	80	100

Appendix D

Table D. 2: Socio-demographics sample. Reference values sourced from Statistiek Vlaanderen 2020

	Participants (n=994)	Flemish population
Gender		
Male	496 (49.9%)	49.5%
Female	498 (50.1%)	50.4%
Other	0%	
Age (years)		
	52.05 (14.38)	41.5
Education (highest completed degree)		
None / Primary school	36 (3.4%)	17.7%
Secondary education	386 (38.8%)	39.6%
Tertiary education	561 (56.5%)	42.7%
Other	11 (1.1%)	.
Household size		
1	164 (16.5%)	.
2	472 (47.5%)	.
3	146 (14.7%)	.
4	163 (16.4%)	.
5	43 (4.0%)	.
> 5	6 (0.6%)	.
Employment state		
Student	15 (1.5%)	
Full time employee	436 (43.9%)	
Part time employee	96 (9.7%)	69.4%
Self-employed / Liberal profession	46 (4.6%)	
Unemployed and searching	18 (1.8%)	
Unemployed and non-searching	34 (3.4%)	2.5%
Unemployable	51 (5.1%)	
Retired	298 (30.0%)	28.1%
Net household income per month		
< €1000	11 (1.4%)	3.7%
€1001 - €2000	182 (23.0%)	36.2%
€2001 - €3000	202 (25.5%)	41.8%
€3001 - €4000	182 (23.0%)	13.1%
€4001 - €5000	132 (16.6%)	2.7%
> €5000	83 (10.4%)	2%
Don't know	29	
Prefer not to answer	173	