# ENVIRONMENTAL IMPACT MADE SIMPLE

## The Eco-Score and Its Potential to Drive Sustainable Decision-Making

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# Environmental Impact Made Simple

## The Eco-score and Its Potential to Drive Sustainable Decision-Making

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# Abstract

Assessing the environmental impact of food is often a challenge for consumers. To guide consumers towards responsible consumption and thereby stimulate pro-environmental consumer behaviour, the Eco-score is developed. The Eco-score is a front-of-pack food label that indicates the environmental impact of a product, categorised from letters A (low impact) to E (high impact). This paper explores the relationship between the Eco-score and consumer decision making towards sustainable options, examining its effectiveness across different product categories. To answer the research questions, quantitative research was conducted in March 2023, utilizing a between-subject approach. Through an online questionnaire, 279 Dutch participants were asked to make product choices in four different food categories: pizza, granola, chips and yoghurt. Sustainable decision making was compared between a control group (packages without Eco-score) and treatment group (packages with Eco-score). Results demonstrate that presence of the Eco-score successfully increases sustainable decision making. Further, presence of the Eco-score increases consumer awareness of sustainability. The effect of the Eco-score on sustainable decision making was found to be stronger in a healthy product category (granola and yoghurt), compared to an unhealthy product category (pizza and chips). Providing the Eco-score on product packages can thus help increase sustainable decision making. This study serves as a steppingstone for further research on the Eco-score. Based on this, implementation of the Eco-score in Dutch supermarkets can be deployed.



*Keywords*: Eco-score, Sustainable Consumption, Decision Making, Product Category, Awareness

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# 1 Introduction

The food system is responsible for between 25% and 35% of the global greenhouse gas (GHG) emissions (Crippa et al., 2021; Poore & Nemecek, 2018). Consumers can play a big role in reducing the impact on the environment by changing their diets (Poore & Nemecek, 2018). Although there is an increasing awareness among consumers of possible environmental impacts of their purchases, it has not led to major behavioural changes yet (Schmuck et al., 2018). Intentions to behave environmentally conscious differ from actual behaviour, causing an attitude-behaviour gap or 'green gap' (Essiz et al., 2022; Schäufele & Janssen, 2021). Knowledge levels of the environmental impact of food production and consumption are generally low among consumers (Hartmann et al., 2021). Consumers significantly underestimate the energy consumption and GHG emissions of foods (Camilleri et al., 2018). Effective communication of environmental information could reduce the problem of the attitude-behaviour gap (Poore & Nemecek, 2018; Vlaeminck et al., 2014). Simplified labels placed at the front of packages, also called front-of-package (FOP) labels, can play an interesting role here (Grunert et al., 2014).

Consumers currently mostly rely on labels such as 'Organic', 'Fair Trade', 'EKO', 'Beter Leven' or 'Biologic' when evaluating sustainability of food (Consumentenbond, 2021; Lazzarini et al., 2016; Siegrist & Hartmann, 2019). Many sustainability labels exist with their own meaning, each covering a particular aspect of sustainability. Research suggests that the meaning of different environmental labels is not always understood or trusted by consumers (Gadema & Oglethorpe, 2011; Grunert et al., 2014; Mancini et al., 2017; Rousseau, 2015; Taufique et al., 2016). Yet, recent research shows that 57% of consumers think it is important to know more about the environmental impact of a product or foodstuff (Consumentenbond, 2021). The same research shows that 59% of consumers think that a sustainability label helps to make a good choice in this respect.

For the purpose of stimulating pro-environmental consumer behaviour, an unambiguous, independent and immediately understandable environmental label should be developed. This was done by a group of French initiators, who launched the Eco-score in January 2021 (see Figure 1). The Eco-score is a FOP food label that measures the environmental impact of food, designed to guide consumers towards more responsible consumption (*Eco-score*, 2022). The design of the Eco-score is based on the design of the Nutri-score, a label that helps consumers compare products simply and quickly to make healthy food choices (Egnell et al., 2018; Julia et al., 2016). The Eco-score categorises the environmental impact of food products on a scale from 0-100. The higher the score, the more sustainable the product is. A combination of colour-coding (from dark green to red) and letters A (low) to E (high) indicates the environmental impact a product has. The Eco-score is calculated based on Life Cycle Assessment (LCA), supplemented by four other quality criteria (*Eco-score*, 2022). The fundamental concept of LCA is to analyse products 'from cradle to grave': 'all environmental burdens connected with a product or service have to be assessed, back to the raw materials and down to waste removal' (Klöpffer, 1997, p. 223). The environmental impacts of production, transport, fabrication and packaging together make up a score between 0 and 100 (*Eco-score*, 2022). Based on the four other quality criteria, the score is supplemented and/or subtracted with points ranging from -15 to +20. These four criteria are recyclability of packages, labels (EU Bio, Demeter, MSC, etc.), provenance of ingredients and seasonality of food. To illustrate the calculation of the Eco-score, an example of honey will be used (Colruyt Group, n.d.). First, the LCA is calculated and comes out to 82 points, which means that the environmental impact of the honey is not very high. These 82 points are then supplemented or reduced by points based on the four additional quality criteria. The product is Organic and Fairtrade produced, for this reason the score gets 20 extra points. The honey is packed in a plastic bottle, which causes 12 points deduction. The honey is transported from Nicaragua, which makes for 4 minus points. Seasonality is irrelevant in the

case of honey, so no extra points will be supplemented or reduced for this. This total calculation comes to 86 points, putting the product in category A of the Eco-score (Colruyt Group, n.d.).


*Figure 1: Eco-score (*Eco-score, *2022).*

The aim of this research is to examine the influence of the Eco-score on stimulating responsible consumption, by considering the impact of consumer awareness of sustainability and product category. When a positive influence of the Eco-score is proven, it strengthens the argument for policy makers and retailers to oblige manufacturers to put the Eco-score on their packaging. This encourages manufacturers and retailers to offer more sustainable products (Meis-Harris et al., 2021). Apart from studies by De Bauw et al. (2021) and Neumayr and Moosauer (2021), no research has been done on the Eco-score design as depicted above in Figure 1. The two previous studies showed opposing results on the effect of the Eco-score on sustainable purchasing behaviour. Also, studies done on similar sustainable label formats such as rankings and traffic light labelling show promising results (Meyerding et al., 2019; Muller et al., 2019; Rondoni & Grasso, 2021; Vlaeminck et al., 2014). For both reasons, it is interesting to investigate the effects of the Eco-score on sustainable decision making. In addition, research indicates that the effectiveness of FOP labelling systems, such as the Nutri-Score, varies across food categories (Aschemann-Witzel et al., 2013; Grunert et al., 2010; Julia et al., 2016). This has not yet been investigated for sustainability labels such as the Eco-score, which makes it interesting to investigate for this study. Lastly, studies indicate limited understanding of environmental labels by consumers (Gadema & Oglethorpe, 2011; Grunert et al., 2014; Mancini et al., 2017). However, the usefulness of a FOP label in purchasing situations relies on consumers' understanding of the information it provides (Grunert & Wills, 2007; Onwezen et al., 2021). The Eco-score is designed to guide consumers in their decision making (*Eco-score*, 2022). It is therefore useful to investigate whether the Eco-score really accomplishes this, and thus whether people become more aware or sustainability.

Taking into account what is currently missing or contradicting in the literature, the following research question is sought to be answered: *'What is the influence of the Eco-score on stimulating responsible consumption?'*. To answer this research questions, the following sub-questions are formulated:

1. To what extent does the Eco-score impact consumer decision making towards more sustainable options?
2. Does the product category affect the effectiveness of the Eco-score on sustainable decision making?

Answers to the research questions will be sought through an online questionnaire, held in Dutch. The questionnaire uses a between-subject approach to evaluate the effect of the Eco-score presence (compared to absence) on consumers' food choice. In the next chapter, Chapter 2, the theoretical framework will be presented. Chapter 3 will elaborate more on the methodology of this study. In Chapter 4, the results will be presented. Chapter 5 will discuss the results, including practical implications and recommendations for future research. In Chapter 6, conclusions will be drawn from the results.

# 2 Theoretical Framework

The theoretical framework depicted in Figure 2 is mostly based on a theoretical framework developed by Grunert and Wills (2007). They developed a framework on consumer response to nutrition information on food labels, including, among others, understanding and use. Instead of investigating the consumer response to nutrition information on food labels as Grunert and Wills (2007) did, the consumer response to sustainable information will be examined in this report. Variables from the framework of Grunert and Wills (2007), including perception, understanding and use, are adapted and supplemented with variables from other theories and frameworks (e.g., Bialkova & van Trijp, 2010; Bialkova et al., 2014; Buerke et al., 2016; Chartrand, 2005; Kareklas et al., 2014; Weibel et al., 2014). Sustainable decision making in this figure means whether consumers choose products with a high Eco-score, and thus Eco-score A.

It is important to note that within presence of the Eco-score, there are different levels. The eco-score can namely take the value A, C and E. The first and the second hypothesis focus on the difference between presence and absence of the Eco-score. The third hypothesis is not directly related to the Eco-score and the fourth hypothesis focuses only on results within the presence of the Eco-score.

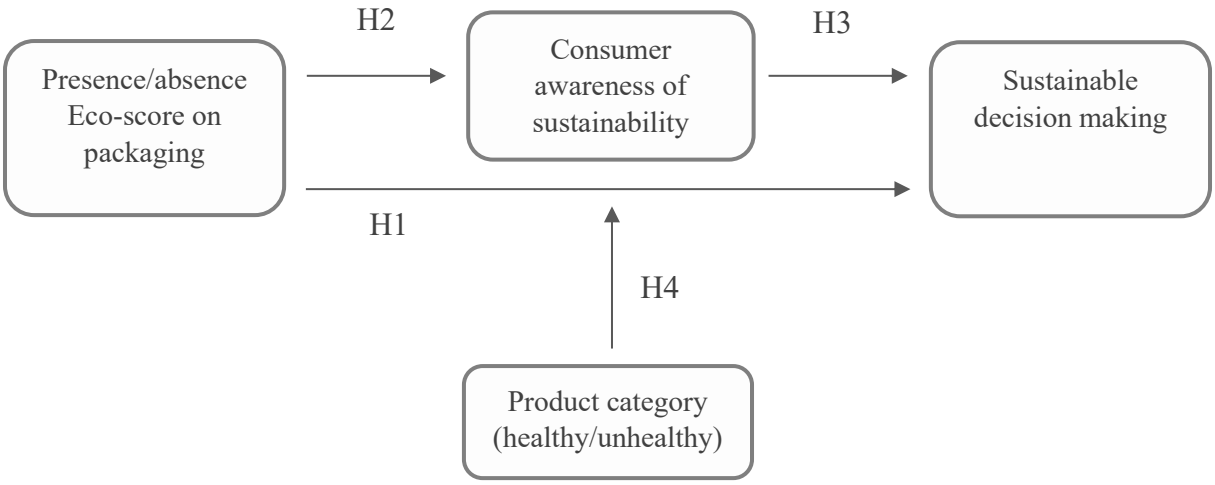


*Figure 2: Theoretical Framework*

## 2.1 Presence/absence of Eco-score

Influence of FOP labelling on sustainable decision making has been studied broadly in the past. A systematic literature review by Onwezen et al. (2021) compared studies on different sustainable labelling formats. Studies on labels, including 'Fair trade', 'Organic', 'Carbon footprint', 'Water footprint', and 'Animal welfare', were investigated and the results indicate that a slight majority of articles show a significant effect of labelling compared to no labelling. In general, labelling increases awareness of sustainable products and willingness to pay for these products. However, research also suggests that consumers barely take these kind of FOP labels into account when shopping for food (Onwezen et al., 2021).

The reason a limited amount of consumers considers FOP labels, may be related to their comprehensibility. Rondoni and Grasso (2021) reviewed literature on different carbon footprint labels. The literature review shows that there is lack of knowledge of carbon measurements and understanding of the existing carbon footprint label system among consumers. The authors suggest re-designing carbon

footprint labels using consumer friendly symbols (such as traffic light colours), to increase consumer understanding. The effectiveness of label formats more similar to the Eco-score, such as rankings or traffic light labelling, have been investigated as well and in fact show promising results. Vlaeminck et al. (2014) compared six alternative environmental information cards, which differ in the given amount of information. An information card including a general sustainability rating and a standardized colour scale for different environmental attributes was evaluated as most accessible. Using this card in an experimental supermarket increased eco-friendly food consumption. Another study compared different information levels of eco-rankings as well, this time via a mobile app (Weber, 2021). The study also examined how these eco-rankings influence decision uncertainty and sustainable purchasing behaviour. Results showed that a simple eco-ranking lowers decision uncertainty and increases sustainable consumption. These results are supported by Meyerding et al. (2019) and Muller et al. (2019), who also compared different labelling formats including traffic light coding. Results showed again that environmental FOP labelling reduce environmental impacts of food choices.

Some studies also investigated the effect of combined traffic light labelling on both healthy and sustainable consumption. Osman and Thornton (2019) examined labels with very similar design to the Eco-score and Nutri-score in a simulated canteen environment and noticed positive behaviour change towards more healthy and sustainable meal choices. Another study examined the combination of labels with the same design as the Eco-score and Nutri-score (De Bauw et al., 2021). They found that the nutritional quality of food choices improved using the dual traffic light labelling system, however, the environmental impacts associated with food were not reduced. One possible reason the authors give for this is familiarity with the scores. This is because the Eco-score was not on the market during data collection, while the Nutri-score was. The Construal Level Theory, developed by Trope and Liberman (2010), can offer an explanation for the variance in effectiveness as well. According to the theory, mental constructs can be formed in two distinct ways: one being a detailed and psychologically near interpretation (low-level construal), while the other being an abstract and psychologically distant interpretation (high-level construal). As Jäger and Weber (2020) suggest, sustainable choices and outcomes typically represent high construal levels, given that the adverse consequences of unsustainable behaviour are not always directly attributable to individual actions. (Jäger & Weber, 2020). On the contrary, the effects of a healthy diet are more concrete as it affects an individual more directly (Ronteltap et al., 2012). Since the benefits of sustainable consumption are further away from the self than the benefits of healthy eating, people might rely more on the Nutri-score than on the Eco-score in their decision making. Contrary to what De Bauw et al. (2021) found, Neumayr and Moosauer (2021) proved that the Eco-score reduces the environmental impact of food choices. In their study, various Eco-label designs were compared, and it was discovered that the Eco-score design exhibited the most promising potential in boosting sales of sustainable and organic food. Using this label, consumers were directed towards choosing more sustainable and organic products. Research on the Eco-score label thus shows varying results, for this reason the influence of the Eco-score on sustainable choice behaviour will be investigated.

To examine the influence of the Eco-score on stimulating responsible consumption, both the presence and absence of the Eco-score on packages will be examined. Food is a low involvement product for most consumers (Thøgersen et al., 2012). Therefore, shoppers often lack ability and willingness to conscious consider their actions with grocery shopping (Lehner et al., 2016). Despite consumers' motivation and willingness to purchase more sustainable products, their limited access to the environmental impact of the product forces them to rely on heuristics (Vlaeminck et al., 2014). Heuristics are defined as 'rules of thumb that people use to make choices' (Scheibehenne et al., 2007, p. 578). These choices are based on only a few important pieces of information, such as whether a

product is locally produced or organic (Scheibehenne et al., 2007; Vlaeminck et al., 2014). Heuristics can, however, not always be trusted since producers make use of misleading claims and greenwashing (Vlaeminck et al., 2014). The colourful and recognizable design makes the Eco-score accessible for heuristics as well, for example because people intuitively associate red with 'stop' and 'bad' and green with 'go' and 'good' (De Bauw et al., 2021; Schuldt, 2013; Thøgersen & Nielsen; 2016). The positive impact of traffic-light labelling and colour-coding to promote sustainable consumption has been proven by multiple studies (Osman & Thornton., 2019; Panzone et al., 2020; Thøgersen & Nielsen, 2016). Therefore, it is assumed that the presence of the Eco-score promotes sustainable consumption. This leads to the first hypothesis:

**H1**: The presence of the Eco-score positively influences sustainable decision making (compared to absence of the Eco-score).

## 2.2 Consumer Awareness of Sustainability

The relationship between presence/absence of the Eco-score and sustainable decision making is expected to be mediated by consumer awareness of sustainability. Consumer awareness of sustainability can be described as the 'belief that one's actions make a difference' (Buerke et al., 2016, p. 962). As mentioned in the introduction, consumers are increasingly aware of the possible impacts of their purchases (Schmuck et al., 2018). Knowledge on the environmental impact of food is, however, still low among consumers (Hartmann et al., 2021). One way to change the food system into a more sustainable one, is through enabling informed decision-making and increasing consumers' awareness of sustainable food choices, for example by means of sustainability labels (Camelleri et al., 2019). However, sustainability labels are currently not always understood by consumers (Gadema & Oglethorpe, 2011; Grunert et al., 2014; Mancini et al., 2017). Research confirms this and concludes that consumers struggle to make purchase decisions based on sustainability labels when they encounter difficulty in understanding them (Thøgersen & Nielsen, 2016). Gadema and Oglethorpe (2011) show similar results, their findings revealed that consumers do not feel adequately informed to rely on carbon footprint labelling for their purchasing decisions and are unable to choose sustainable products using carbon-based value judgements. A FOP label, however, can only be helpful in purchase situations if consumers understand the label (Grunert & Wills, 2007; Onwezen et al., 2021).

According to the model on consumer awareness from Chartrand (2005), environmental features activate an automatic process, leading to a certain outcome. Following this model, the Eco-score is an environmental feature that activates automatic processes including heuristics, leading to an outcome which is in this case consumer choice. Awareness of the outcome of a certain behaviour is important, stress Koenig-Lewis et al. (2014). They explain that in situations when consumers have limited comprehension of the connection between their product choices and environmental consequences, they tend to rely more on heuristics and habits. To ensure these product choices are environmentally friendly, the heuristic cues should fit eco-friendly consumption or consumers should be able to evaluate the environmental impact of their product choices. The Eco-score is developed to serve as a guidance in sustainable decision making (*Eco-score,* 2022). With its recognisable traffic-light colours and scores from A to E, the Eco-score is expected to be interpreted easily. With presence of the Eco-score, people can easily judge how sustainable a product generally is. Therefore, it is expected that the presence of the Eco-score on packages creates consumer awareness of sustainability. This leads to the following hypothesis:

**H2**: The presence of the Eco-score positively influences consumer awareness of sustainability (compared to absence of the Eco-score).

The degree to which consumers are aware of the possible impacts of their purchases has been shown to impact decision making. In their paper, Hansen and Schrader (1997) emphasise that a prerequisite for responsible consumption is the creation of consumer awareness. Buerke et al. (2016) investigated the motivating factors of responsible consumer behaviour. Results show that consumers with greater environmental awareness have a higher probability of considering the consequences of their consumption, which positively influences responsible consumer behaviour (Buerke et al., 2016). When consumers are able to make sustainability judgements based on the Eco-score, it is expected that consumers also make sustainable decisions. Therefore, the following is hypothesis ed:

**H3**: Consumer awareness of sustainability positively influences sustainable decision making.

## 2.3 Product Category

In the literature, some information on the impact of the product category on the effectiveness of FOP labelling can be found. Research on different food categories and the influence of a FOP label on healthy purchasing decisions show varying results. For example, Egnell et al. (2020) found no big differences in the effect of Nutri-score on food choices across product categories (pizza, breakfast cereal, and cake). On the contrary, Grunert et al. (2010) found that the extent to which consumers make use of nutrition information when doing groceries depends on the product category. It is presumed that nutrition information is more sought after for products considered healthier, like breakfast cereals and yogurt, in comparison to less healthy options such as sweets, salty snacks and soft drinks. The authors suggest this is because consumers exhibit reduced interest in nutritional information when it comes to indulgence-type products. Aschemann-Witzel et al. (2013) also found a significant difference between product categories. In their study on the effect of different FOP nutrition labelling formats on supporting consumers with their decision making, they found a larger health improvement in the savoury snack product category than in the sweet snack product category. They explained this with the fact that savoury snacks had a wider range of choice in terms of healthfulness in their experiment (Aschemann-Witzel et al., 2013). Similarly, Julia et al. (2016) found an effect of the Nutri-score on the nutritional quality of sweet biscuits that were purchased, while healthiness of the purchased salty snacks and breakfast cereals did not improve. They substantiate this difference by explaining that expectations and specific perceptions regarding a product category can influence the likelihood of utilising the label in a purchasing scenario, which is in line with the conclusion of Grunert et al. (2010). Regarding sustainability labels, no research has yet been done on the difference in effectiveness of the label between product categories. For this reason, the moderating role of the product category on the relationship between presence of the Eco-score and sustainable decision making will be investigated. It is assumed that indulgent food serves more egoistic purposes (and short-term gratification) compared to healthier food, and less attention is given to the Eco-score when shopping for this type of food.

Bialkova and van Trijp (2010) explain two types of attention: stimulus-directed attention (about which later more) and goal-driven attention. Goal-driven attention is given when a stimulus is relevant in relation to the consumer's objectives (Bialkova & van Trijp, 2010). In other words, when consumers want to find sustainability information, the probability that they pay attention to the Eco-score will be higher. The shopping goal has been shown to be an important factor for visual attention to labels in other domains than sustainability; several studies prove that consumers pay more attention to the nutrition label if their goal is to make healthier purchases (Bialkova & van Trijp, 2010; Bialkova et al., 2014; Visschers et al., 2010). As mentioned earlier, the degree in which consumers pay attention to nutritional information depends on the product category. This can be explained by the fact that consumers can have different mindsets when shopping for food, namely an egoistic (help yourself) and altruistic (help others)

mindset (Kareklas et al., 2014). Weibel et al. (2014) show that the activation of an egoistic or altruistic self-concept influences how (un)healthy people choose to eat. Unhealthy food is often regarded as more tasty than healthy food and is therefore a more hedonic and indulgence-type of product (Raghunathan et al., 2006). In their research, Weibel et al. (2014) found that when people intend an altruistic action, they are more likely to choose healthy foods, and vice versa for egoistic intentions. Healthy food choices can thus be linked with an altruistic mindset and unhealthy food choices can be linked with an egoistic mindset. When talking about sustainable decision making, organic food consumption is guided by a combination of egoistic (personal health) and altruistic (the environment) motivations (Kareklas et al., 2014). Linking all this information together, one could say that when people are in a more egoistic mindset, they are more likely to choose unhealthy products, and pay less attention to label information. Likewise, when people are in a more altruistic mindset, they are more likely to choose healthy and sustainable products, and pay more attention to label information. Therefore, it is expected that when people are shopping in an unhealthy product category, they are placed in an egoistic mindset and pay less attention to the Eco-score. Correspondingly, it is expected that when people are shopping in a healthy product category, they are placed in an altruistic mindset and pay more attention to the Eco-score. In presence of the Eco-score, it is expected that the strength of the effect of this label on sustainable food choice depends on the product category. This leads to the following hypothesis:

**H4**: The effect of the Eco-score on sustainable decision making will be stronger in a healthy product category (compared to an unhealthy product category).

## 2.4 Consumer Visual Attention

Consumers' visual attention to FOP labels and its relationship with the decision-making process has been studied in the past. In consumer behaviour literature, attention is defined as ‘the degree to which consumers focus on a stimulus within their range of exposure’ (Solomon et al., 2013, p. 134). When looking at both the theoretical model on consumer response to nutrition information on food labels and information processing models, the importance of the attention process for actual behaviour becomes clear (Atkinson & Shiffrin, 1968; Grunert & Wills, 2007). As a matter of fact, labels can only be expected to have effect when consumers are exposed to them (Grunert & Wills, 2007). Literature on consumer attention to sustainability information is of limited availability (Van Loo et al., 2018). Samant and Seo (2016) found that better label education increased the visual attention to label claims for chicken products. Van Loo et al. (2015), investigated consumer’s visual attention to sustainability labels on coffee by making use of eye-tracking methodology. They found that a higher fixation time on sustainability labels increased the probability that consumers choose coffee displaying these labels. Van Loo et al. (2021) confirm this and say that visual attention for claims related to sustainability and nutrition, is associated with a higher choice probability.

Visual attention is also investigated in other domains. In their literature review, Graham et al. (2012) highlight the importance of visual attention on nutritional labels for decision making, because consumers consider this label information when making food choices. Research from Bialkova et al. (2014) investigated the effect of attention to nutrition label information on consumer choice, by making use eye-tracking as well. It was found that products with labels that receive most visual attention had a higher probability of being chosen, which shows that attention mediates the effect of nutrition labels on choice. As stated before, consumer’s attention to labels can be determined by stimulus-driven attention as well. Stimulus-driven attention can be described as attention directed towards a stimulus because the stimulus stands out within the visual field. Bialkova and van Trijp (2010), investigated the key determinants of stimulus-driven attention for nutrition labels by measuring reaction time and accuracy. They found that label characteristics (such as position of the label on the FOP, display size and colour

scheme), familiarity with the type of logo and familiarity with the location of the label on the packaging are key determinants of consumer attention to labels.

Based on previous research, it can be concluded that visual attention to FOP labels plays an important role in consumer decision making. Visual attention will serve as a manipulation check in this study and will thus examine whether participants actually pay attention to the Eco-score, and whether this influences choice behaviour.

## 2.5 Consumer Characteristics

Research shows that the effectiveness of sustainability labels is to a great extent determined by personality traits (Vandenbroele et al., 2019). Product attribute preference and sustainable buying behaviour are mostly guided by knowledge, beliefs, and life-style values rather than socio-demographic profiles (Onwezen et al., 2021). The only socio-demographic characteristics that do drive consumer preference for sustainable diets are gender (females) and education (high educated people) (Tobi et al., 2019). The higher the environmental consciousness of consumers, the more they value sustainable product attributes (Tobi et al., 2019). The greater the environmental concern of consumers, the more positively they rate products with sustainability labels, the more they are willing to pay for them and the more time they spend checking sustainability information during food choice (Rondoni & Grasso, 2021). It is thus unavoidable that consumer characteristics will influence sustainable decision making. Therefore, consumer characteristics is considered as a control variable in this study. In specific, the demographics age, gender, education level and environmental concern will be investigated.

## 2.6 Packaging Attractiveness

Packaging design is one of the many extrinsic cues on which consumers can base their decision making. Nonverbal components (such as colour, form and size), verbal components (such as name, brand, and information) and package features (such as simplicity and ergonomics) are all elements of packages (Butkevičienė et al., 2008). In consumer research studies, product attractiveness is often associated with higher purchase intentions (Schnurr et al., 2017; Soler-Anguiano et al., 2022). However, prior research shows it's not the most crucial factor in the decision-making process. A study performed in 2001 compared the importance rating of different general choice criteria, which were package attractiveness, environmental consequences, product familiarity, quality, effects on own health, personal experience and taste. Results showed that package attractiveness was least important, followed by environmental consequences which was rated as slightly more important (Grankvist & Biel, 2001). In this study, it will be investigated whether a high Eco-score overrules package unattractiveness. In other words, it will be investigated whether consumers indeed find environmental consequences more important than attractiveness of packaging. Therefore, packaging attractiveness serves as a control variable in this study.

# 3 Methodology

## 3.1 Participants

From the 13th to the 30th of March 2023, participants were recruited in the Netherlands. The sample was sought to contain at least 200 participants and be representative to the Dutch population, with equal coverage of gender and representative coverage of age groups. People were encouraged to complete the questionnaire by raffling off four vouchers worth €15 among interested participants (*Keuze Cadeaukaart*, n.d.). Sample recruitment was carried out by means of convenience sampling, and the author's virtual social network (WhatsApp, LinkedIn, Instagram, Facebook) was used to recruit participants. Besides, snowball sampling was used, as participants were asked to share the questionnaire with their network as well. A representative sample is important to make valid statistical inferences or generalize the data to the entire population. To avoid the risk of an unrepresentative sample due to convenience sampling, recruitment was also carried out through an online community called Food Forum from Future of Food Institute (Future of Food Institute, 2023). In order to enhance the ecological validity of this study, participants who reported never purchasing any of the food product categories examined were excluded from participation, as they have a low likelihood of making these purchasing decisions in a real-life scenario (Egnell et al., 2020). Apart from the aforementioned requirement and a Dutch nationality, no other participation requirements were imposed.

## 3.2 Design and Stimuli

***Design***

The programme used to carry out the questionnaire was Qualtrics. To eliminate errors in the questionnaire, a pre-test was carried out with 10 participants. This study used a between-subjects approach to evaluate the effect of the Eco-score presence on consumers' food choices. More specifically, it was investigated whether presence (compared to absence) of the Eco-score led consumers to choose more sustainable products, and thus products with Eco-score A.

Participants were invited to respond to an online questionnaire, held in Dutch. Participants were randomly allocated to the control group (33%) or treatment group (66%). The control group was exposed to packages without Eco-score, the treatment group was exposed to packages with the Eco-score. The treatment group was then randomly split into two groups, with one group choosing products within healthy food categories (33%), and one group choosing products within unhealthy food categories (33%). The control group was exposed to both the healthy and unhealthy product categories. See Table 1 for a clear overview of the groups, assigned product categories and final percentage of participants.

*Table 1: Participant Groups and Assigned Food Categories*

| **Group** | **Presence Eco -score** | **Product category** | **Number of product categories tested** | **% of participants** |
|---|---|---|---|---|
| Control group | No | Healthy and unhealthy | 4 | 33.7% |
| Treatment group healthy | Yes | Healthy | 2 | 31.5% |
| Treatment group unhealthy | Yes | Unhealthy | 2 | 34.8% |

Before entering the questionnaire, a short explanation of the research and confidentiality was given to participants. By clicking on the 'next' button, people agreed to participate in the study. When starting the questionnaire, participants were asked to answer questions from their randomly allocated group. For

each of the three groups, participants were first asked to answer a question about the purchase frequency of the tested food categories (pizza and chips and/or granola and yoghurt) (Egnell et al., 2020). The question 'How often do you buy the following products?' was answered with the options very often (weekly), often (monthly), sometimes (once every half a year), rarely (once a year), and never (scale adapted and supplemented from Bhandari, 2023). Participants who answered 'never' for every product category, were excluded from the questionnaire and sent directly to the end of the questionnaire (Egnell et al., 2020). Next, for each product category, three questions were asked. Participants were first asked to perform a choice task, in which they select one product among three product options with the question 'Assuming you wanted to buy this kind of food, which product would you choose?' (question adapted from Egnell et al., 2020). Second, to examine whether participants agree with the category classification created by the author, participants were asked to assess the healthfulness of the category: 'How (un)healthy do you think this product category is?'. The answer options ranged from very unhealthy to very healthy in a 9-point slider scale (scale inspired from Bhandari, 2023). Third, to examine liking of packages, the question 'How attractive do you find the packaging?' was asked for each product without the Eco-score. The answer options ranged from very unattractive to very attractive on a 9-point slider scale (scale inspired from Bhandari, 2023). After these three questions have been answered for each product category, the following question was asked to test consumer awareness of sustainability: 'How easy was it for you to assess the sustainability of the products displayed?' (question inspired from Egnell et al., 2020). The answer options ranged from very difficult to very easy on a 9-point slider scale (scale inspired from Bhandari, 2023). The treatment groups were asked one more question: 'Do you remember seeing the Eco-score label?' with answer options yes, unsure and no (question and scale adapted from Egnell et al., 2020). At the end of the questionnaire, all participants were asked some socio-demographic questions about gender, age and educational level. Lastly, participants were asked to answer the question 'How concerned are you about the environment?' with a 9-point scale ranging from not at all concerned to very concerned (question and scale inspired from Bhandari, 2023 and Rondoni & Grasso, 2021). At the end of the questionnaire, there was space to leave comments and a mail address for the voucher giveaway, and participants were thanked for their participation.

***Stimuli***

Within the online questionnaire, participants were exposed to two or four food categories, depending on which participant group they were randomly assigned to. These food categories (1) display high variability in healthfulness and are (2) commonly consumed in the Netherlands. The chosen product categories were pizza margherita, sea salt potato chips, granola with red fruit, and plain yoghurt. Pizza and chips belong to the unhealthy product category, and granola and yoghurt belong to the healthy product category. For each product category, a set of three products (with distinct sustainability levels) was developed (see Figure 3 for the pizza product category as an example and Appendix 1 for a complete overview of the product categories with corresponding products). The product images were used from American (Target and Wallmart) and British (Morrisons and Tesco) online grocery stores. The images of the three Eco-scores were used from the Belgian supermarket named Colruyt (Colruyt Group, n.d.). As it was not possible to calculate the Eco-scores of the chosen products and in order to avoid the influence of personal preference, the Eco-scores (Eco-score A, C and E) were randomly assigned to the products. To eliminate the influence of other factors on participant's choices, information or quality indicators (e.g., price, labels, and claims) were left out of packages. Influence of brand was limited by using products that are not available on the Dutch market.

Influence of brand awareness on product choice had to be avoided as much as possible, for that reason pre-tests were conducted with 20 Dutch consumers. In this pre-test, the following question was asked for each product category: 'Are you familiar with any of these products?'. If one product had high

familiarity, it was replaced with another product. The same pre-test was then repeated with 20 new Dutch consumers for the concerning until no extreme familiarity was found. The potential bias of consumer preference for packaging in terms of attractiveness was controlled for by implementing consumer liking as control variable. To eliminate any potential bias linked to the presentation order of categories and products, the order in which food categories and products within sets were presented was randomised.


*Figure 3: Pizza Margherita Product Category with Eco-score*

## 3.3 Data Analysis

All data was analysed using a statistical software program called SPSS. In the control group four product categories were tested, and in both treatment groups two product categories were tested. To avoid the effects of the same participants answering and thus repeated measures, it has been taken into account during data processing. Statistical tests were considered as statistically significant with a p-value of $< 0.05$. The following sections explain more detailed how the variables are categorised and which data will be analysed for each hypothesis:

***Hypothesis 1***

For the first hypothesis 'The presence of the Eco-score positively influences sustainable decision making (compared to absence of the Eco-score)', it was measured whether there was difference in product choice between the control- and treatment group. The independent variable was presence of the Eco-score (categorised as absent and present), and all product categories with and without the Eco-score were included in the analysis. The dependent variable was sustainable decision making, and contained three answer options (with Eco-scores A, C and E for the treatment groups). Sustainable decision making meant choosing for the product with Eco-score A (vs. C and E). The first hypothesis was analysed using a chi square test.

***Hypothesis 2***

The second hypothesis 'The presence of the Eco-score positively influences consumer awareness of sustainability (compared to absence of the Eco-score)' was measured through examining whether it was easier for participants exposed to the Eco-score to assess the sustainability of a product. The difference in self-reported ease between the control- and treatment groups was tested. Here, the independent variable was presence of the Eco-score (categorised as absent and present), and all product categories with and without the Eco-score were included in the analysis. The dependent variable here was consumer awareness of sustainability, and the accompanying question contained answer options on a nine-point scale (ranging from very difficult to very easy to assess the sustainability of the product). The second hypothesis was analysed using Student's t-test.

***Hypothesis 3***

For the third hypothesis 'Consumer awareness of sustainability positively influences sustainable decision making', it was measured whether participants who have higher sustainability awareness also make more sustainable product choices. The relationship between the self-reported consumer awareness and sustainable product choice was thus examined. The independent variable was self-reported consumer awareness, and was measured on a 9-point scale (ranging from very difficult to very easy to assess the sustainability of the product). The dependent variable was sustainable decision making and contained three answer options (with Eco-scores A, C and E for the treatment groups). Sustainable decision making again meant choosing for the product with Eco-score A (vs. C and E). The third hypothesis was analysed using binary logistic regression.

***Hypothesis 4***

For the fourth hypothesis 'The effect of the Eco-score on sustainable decision making will be stronger in a healthy product category (compared to an unhealthy product category)', outcomes between the two treatment groups were compared. First, it was investigated whether classification of the product categories by the author was in line with those of the participants, by comparing the mean health ratings of the product categories. After this, it was investigated whether there was a difference in product choice between the healthy- and unhealthy product category treatment groups. For the two product categories, the independent variable was presence of the Eco-score (categorised as absent and present) and the dependent variable was sustainable decision making and contained three answer options (with Eco-scores A, C and E for the treatment groups). Sustainable decision making again meant choosing for the product with Eco-score A (vs. C and E). The fourth and last hypothesis was analysed using chi square tests. In specific, Cramer's v was used to measure how strongly the variables were associated. Cramer's V takes a value between 0 and 1. The closer to 1, the stronger the effect is. The Cramer's v outputs of the healthy and unhealthy product categories were compared.

***Consumer visual attention***

Consumer visual attention was initially investigated as a manipulation check. It was looked at whether and how many participants within the treatment group noticed the label on the packages. The aim of doing this was to confirm if the manipulation used in the study was noticeable. Out of curiosity and due to some expectations based on literature research, some further analysis was done. First, it was investigated whether visual attention to the Eco-score differed between the healthy- and unhealthy treatment groups, using a chi-square test. The independent variable was visual attention and contained three answer options (yes, no and I don't know), and the dependent variable was product category (categorised as healthy and unhealthy). Next, it was investigated whether visual attention also had a significant effect on sustainable decision making. Here, the independent variable was visual attention and contained three answer options (yes, no and I don't know). The dependent variable was sustainable decision making and contained three answer options (categorized as product A, C and E, with A being the sustainable decision). To investigate whether visual attention is related to sustainable decision making, a chi-square test was used.

***Consumer characteristics***

The consumer characteristics gender, age, educational level and environmental concern served initially as control variables. First, it was examined whether gender, age and educational level differed between the three participant groups, to avoid that sociodemographic differences interfere with the analysis. This was done by looking at the frequency of each variable for each participant group. The effect of environmental concern was also examined. It was examined whether the mean environmental concern differed between the three participant groups, and between the healthy and unhealthy treatment group. This was done through an analysis of variance (ANOVA). Here, the independent variables were the

participant groups (categorized as control group, healthy treatment group and unhealthy treatment group) and the dependent variable was environmental concern (measured on a 9-point scale from not at all to very concerned). Some further analysis was carried out afterwards, out of curiosity and because of expectations based on preceding literature research. It was investigated whether environmental concern influenced sustainable decision making. This was done by a binary logistic regression analysis with environmental concern being the independent variable (measured on a 9-point scale from not at all to very concerned) and sustainable decision making (categorized as product A, C and E, with A being the sustainable decision) being the dependent variable.

***Packaging attractiveness***

Some data was analysed for the second control variable as well. First it was investigated whether the mean attractiveness rating per product differed for each product category, using ANOVA. Here, the independent variable was the product (categorised as three products with Eco-score A, C or E per product category) and the dependent variable was packaging attractiveness (measured on a 9-point scale from very unattractive to very attractive). Afterwards, it was investigated whether packaging attractiveness was related to sustainable decision making. This was analysed using binary logistic regression. The independent variable was packaging attractiveness (measured on a 9-point scale from very unattractive to very attractive) and the dependent variable was sustainable decision making (categorized as product A, C and E, with A being the sustainable decision).

# 4 Results

This chapter covers the results of the online questionnaire. These results are discussed according to the hypothesis. After that, the control variables and the manipulation check are also considered. First, a description of the sample is given.

## 4.1 Description of the Sample

For this research, a total amount of 307 participants were recruited. From the total count of 307 participants, 4 participants were excluded for not meeting the study criteria, as they reported never purchasing any of the food product categories tested. From the remaining 303 participants, 24 participants failed to complete the questionnaire, resulting in a final total of 279 participants. The target sample size was therefore achieved. The number of participants after data cleaning was 94 for the control group (33.7% of the sample), 88 for the healthy treatment group (31.5% of the sample) and 97 for the unhealthy treatment group (34.8% of the sample). In Table 2, the sociodemographic characteristics concerning gender, age and educational level of the sample are shown. The sample is slightly biased towards females (67,0%), age group 18-25 (34,1%) and highly educated people (61,3%). The sociodemographic characteristics are equally distributed among the three participant groups. In Appendix 2 Figure 1, a chart of the purchase frequency per product category can be found. Yoghurt and chips were purchased most frequently by participants, mostly weekly. Pizza was mostly bought monthly, and granola was mostly never bought by participants.

*Table 2: Sociodemographic Variables*

| | | TreatGroup | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Control group | | Treatment group healthy | | Treatment group unhealthy | | Total | |
| | | Count | Column N % | Count | Column N % | Count | Column N % | Count | Column N % |
| Gender | Male | 31 | 33,0% | 28 | 31,8% | 28 | 28,9% | 87 | 31,2% |
| | Female | 60 | 63,8% | 59 | 67,0% | 68 | 70,1% | 187 | 67,0% |
| | Non-binary | 1 | 1,1% | 1 | 1,1% | 0 | 0,0% | 2 | 0,7% |
| | I'd rather not say that | 2 | 2,1% | 0 | 0,0% | 1 | 1,0% | 3 | 1,1% |
| Age | Younger than 18 years | 1 | 1,1% | 0 | 0,0% | 0 | 0,0% | 1 | 0,4% |
| | 18-25 years | 30 | 31,9% | 26 | 29,5% | 39 | 40,2% | 95 | 34,1% |
| | 26-35 years | 11 | 11,7% | 13 | 14,8% | 12 | 12,4% | 36 | 12,9% |
| | 36-45 years | 14 | 14,9% | 7 | 8,0% | 8 | 8,2% | 29 | 10,4% |
| | 46-55 years | 17 | 18,1% | 23 | 26,1% | 17 | 17,5% | 57 | 20,4% |
| | 56-65 years | 14 | 14,9% | 12 | 13,6% | 13 | 13,4% | 39 | 14,0% |
| | Older than 65 years | 7 | 7,4% | 7 | 8,0% | 8 | 8,2% | 22 | 7,9% |
| EduLevel | No degree | 0 | 0,0% | 0 | 0,0% | 0 | 0,0% | 0 | 0,0% |
| | Primary education | 1 | 1,1% | 2 | 2,3% | 0 | 0,0% | 3 | 1,1% |
| | VMBO, HAVO / VWO junior grades, MBO1 | 10 | 10,6% | 13 | 14,8% | 13 | 13,4% | 36 | 12,9% |
| | HAVO, VWO, MBO2-4 | 25 | 26,6% | 23 | 26,1% | 21 | 21,6% | 69 | 24,7% |
| | Bachelor (HBO / WO) | 41 | 43,6% | 26 | 29,5% | 40 | 41,2% | 107 | 38,4% |
| | Master (HBO / WO) | 17 | 18,1% | 24 | 27,3% | 23 | 23,7% | 64 | 22,9% |
| | Doctor, PhD | 0 | 0,0% | 0 | 0,0% | 0 | 0,0% | 0 | 0,0% |

## 4.2 Presence/absence of Eco-score

A chi-square test was used to answer the first hypothesis 'The presence of the Eco-score positively influences sustainable decision making (compared to absence of the Eco-score)'. As visible in Table 3, decision making of products with Eco-score A (Sustainable Decision 'Yes') was higher when the Eco-score label was present (Treatment Groups). In the control group, 23% of the participants made a sustainable choice, this was 36% in the treatment group. Consistent with the primary hypothesis, presence of the Eco-score significantly influences sustainable decision making ($X^2(1) = 14.71$, p = < .001). In Appendix 2, the crosstabulation and chi-square test of the three Eco-scores separately can be

found in Table 1 and 2 and the crosstabulations and chi-square tests concerning sustainable decision making of each product category individually can be found in Table 3-10.

*Table 3: Crosstabulation Sustainable Decision * Participant Group*

| | | Participant group | | | |
|---|---|---|---|---|---|
| | | Control Group | | Treatment groups | |
| | | Count | Column N % | Count | Column N % |
| Sustainable Decision | Yes | 87 | 23,1% | 133 | 35,9% |
| | No | 289 | 76,9% | 237 | 64,1% |
| | Total | 376 | 100,0% | 370 | 100,0% |

## 4.3 Consumer Awareness of Sustainability

A Student's t-test was used to test the second hypothesis 'The presence of the Eco-score positively influences consumer awareness of sustainability (compared to absence of the Eco-score)'. Participants were asked to indicate the easiness of assessing the sustainability of the products within each category, on a scale from 1 being very difficult to 9 being very easy. For the participant groups exposed to the Eco-score, it was easier to estimate the sustainability of the products. Results namely show a mean rating of 4.06 (SD = 2.09) of easiness for the control group (N = 376) and a mean rating of 5.30 (SD = 2.13) for the treatment groups (N = 370). A significant difference in mean rating between the control- and treatment groups was found, $t(744) = -6.489$, $p = < .001$. Hence, the second hypothesis can be confirmed as well.

Hereafter, the third hypothesis 'Consumer awareness of sustainability positively influences sustainable decision making' was answered using binary logistic regression. Consumer awareness of sustainability has been found to be a significant predictor of sustainable decision making; $B = -.080$, $SE = .036$, $Wald = 4.974$, $p = .026$. However, as you move from low to high levels from consumer awareness of sustainability, the predicted probability of someone making a sustainable decision is decreasing (with .080 per one unit increase in consumer awareness). The third hypothesis can thus not be confirmed, as there was no positive but a negative influence.

## 4.4 Product Category

First, it was investigated whether participants agree with the category classification as created by the author. On the scale ranging from 1 being very unhealthy and 9 being very healthy, chips, pizza, granola and yoghurt had mean ratings of M = 3.39, M = 3.86, M = 5.84 and M = 6.98 respectively. The difference in mean health rating between the classified healthy product category and unhealthy product category was significant ($F(1, 744) = 491.663$, $p = < .001$). This demonstrated that the participants' views were in line with those of the author, and the products were well classified. Second, the fourth hypothesis: 'The effect of the Eco-score on sustainable decision making will be stronger in a healthy product category (compared to an unhealthy product category)' was answered. Presence of the Eco-score significantly influenced sustainable decision making for the healthy product category ($X^2(1) = 15.183$, $p = <.001$) (see Table 4), but not for the unhealthy product category ($X^2(1) = 2.595$, $p = .131$) (see Table 5). Calculation of the Cramer's V confirmed the difference between the two treatment groups and gave an output of $V = .204$ for the healthy product category and $V = .082$ for the unhealthy product category. This indicated that the effect of the Eco-score on sustainable decision making was stronger within the healthy product category. The fourth hypothesis can therefore be confirmed.

*Table 4: Crosstabulation Sustainable Decision * Participant Group Healthy Product Category*

| | | Participant group healthy product category | | | |
|---|---|---|---|---|---|
| | | Control Group | | Treatment Group | |
| | | Count | Column N % | Count | Column N % |
| Sustainable decision making healthy product category | Yes | 30 | 16,0% | 59 | 33,5% |
| | No | 158 | 84,0% | 117 | 66,5% |

*Table 5: Crosstabulation Sustainable Decision * Participant Group Unhealthy Product Category*

| | | Participant group unhealthy product category | | | |
|---|---|---|---|---|---|
| | | Control Group | | Treatment Group | |
| | | Count | Column N % | Count | Column N % |
| Sustainable decision making unhealthy product category | Yes | 57 | 30,3% | 74 | 38,1% |
| | No | 131 | 69,7% | 120 | 61,9% |

As discussed, the difference in sustainable decision making between the control- and treatment group was bigger in the healthy product category. However, by comparing Table 4 and 5, it became evident that the percentage of sustainable decisions was slightly higher in both the control- and treatment group of the unhealthy product category, compared to the healthy product category.

## 4.5 Consumer Visual Attention

Beyond the four hypotheses, some data was analysed for the manipulation check. Of the complete treatment group, in total 61% of participants recalled seeing the Eco score, 36% did not recall seeing it and 3% did not know whether they saw it or not (See 'Total' in Table 6). The high number of participants indicating they saw the Eco-score confirmed that the manipulation of adding the Eco-score on packages worked. Some additional analysis was carried out on top of this. As visible in Table 6, the percentage of participants who remember seeing the Eco-score was slightly higher in the unhealthy treatment group than in the healthy treatment group. A chi-square test showed that this difference was, however, not significant ($X^2(2) = .942$, $p = .624$).

*Table 6: Attention for Eco-score per Treatment Group.*

| | | (Treatment) Group | | | | | |
|---|---|---|---|---|---|---|---|
| | | Treatment group healthy | | Treatment group unhealthy | | Total | |
| | | Count | Column N % | Count | Column N % | Count | Column N % |
| Visual Attention | Yes | 102 | 58,0% | 122 | 62,9% | 224 | 60,5% |
| | No | 68 | 38,6% | 66 | 34,0% | 134 | 36,2% |
| | I don't know | 6 | 3,4% | 6 | 3,1% | 12 | 3,2% |

Another additional analysis was done. To investigate whether visual attention was related to sustainable decision making, a chi-square test was used (See Table 7). Results indicated that consumer visual attention to the Eco-score was not significantly related to sustainable decision making ($X^2(2) = .788$, $p = .677$).

*Table 7: Crosstabulation Visual Attention * Sustainable Decision*

| | | Sustainable Decision | | | |
|---|---|---|---|---|---|
| | | Yes | | No | |
| | | Count | Column N % | Count | Column N % |
| Visual Attention | Yes | 83 | 62,4% | 141 | 59,5% |
| | No | 47 | 35,3% | 87 | 36,7% |
| | I don't know | 3 | 2,3% | 9 | 3,8% |
| | Total | 133 | 100,0% | 237 | 100,0% |

## 4.6 Consumer Characteristics

Beyond the four hypotheses, some data was analysed for the control variables as well. Gender, age and educational level are consumer characteristics that served as control variables within the framework. Since gender, age and educational level were evenly distributed between the three participant groups, no effect can be found for those variables. The consumer characteristic 'environmental concern' was also investigated, using an ANOVA analysis. The mean environmental concern was 6.034 for the control group (N=276, SD = 1.59). This mean was lower than the mean of 6.47 for the healthy treatment group (N=167, SD = 1.80), and 6.23 for the unhealthy treatment group (N = 194, SD = 1,86). The mean differences in environmental concern were, however, not significant for the comparison between the control and treatment group ($F(2, 276) = 1.323$, $p$ .268).

Another supplementary analysis was carried out. It was investigated whether environmental concern led to sustainable decision making, by means of a binary logistic regression analysis. Results showed that environmental concern was no significant predictor of sustainable decision making; $B = .028$, $SE = .047$, $Wald = .362$, $p = .547$.

## 4.7 Packaging Attractiveness

Some data was analysed for the second control variable as well. To start, it was investigated whether the mean attractiveness rating per product differed for each product category using ANOVA. The general mean packaging attractiveness was 5.45 for pizza, 5.63 for granola, 4.90 for chips and 5.69 for yoghurt. In Table 8, an overview of the mean packaging attractiveness for each product separately can be found. Within each product category, the attractiveness rating of the three products was significantly different for the pizza ($F(2,569) = 31,337$, $p = <.001$) and granola ($F(2,543) = 15.216$, $p = <.001$) product category. This was not the case for the chips ($F(2, 570) = 1.130$, $p = .324$) and yoghurt ($F(2,543) = 2.639$, $p = .072$) product category. In those product categories, the products were rated about equally attractive. Control variables should be held constant in research, this was not achieved for the second control variable as the attractiveness rating was significantly different for products in the pizza and granola product category.

*Table 8: Packaging Attractiveness for Each Product*

| Category | Product (Eco-score) | Mean | Std. Deviation |
|---|---|---|---|
| Pizza | California Pizza Kitchen (A) | 5.36 | 1.79 |
| | Red Baron (C) | 4.76 | 1.99 |
| | Good & Gather (E) | 6.23 | 1.67 |
| Granola | Tesco (A) | 5.88 | 1.88 |
| | Morrisons (C) | 5.00 | 1.89 |
| | Good & Gather (E) | 6.01 | 1.92 |
| Chips | Herr's (A) | 5.00 | 1.83 |
| | Best Yet (C) | 4.74 | 1.91 |
| | Market Pantry (E) | 4.95 | 1.79 |
| Yoghurt | Mountain High (A) | 5.49 | 1.79 |
| | Morrisons (C) | 5.69 | 1.85 |
| | Stonyfield (E) | 5.92 | 1.63 |

Next, it was investigated whether packaging attractiveness was related to sustainable decision making. Results of the binary logistic regression analysis showed that packaging attractiveness was not related to sustainable decision making for the pizza *(B* = -.016, *SE* = .048, *Wald* = .117, *p* = .732), granola (*B* = -.029, *SE* = .049, *Wald* = .348, *p* = .555), and yoghurt (*B* = -.105, *SE* = .064, *Wald* = 2.656, *p* = .103) product category. For the chips product category, packaging attractiveness was related to sustainable decision making (*B* = .104, *SE* = .047, *Wald* = 4.905, *p* = .027). Only in this product category, participants relied on the appearance of the packaging instead of the Eco-score label. However, as mentioned above, there was no significant difference in attractiveness between the three packages in the chips product category.

# 5 Discussion

## 5.1 Main Findings

Research on the Eco-score label shows different results, for instance, de Bauw et al. (2021) were unable to demonstrate that the Eco-score reduced the environmental impact of food choices. Results of this current study are, on the contrary, in agreement with Neumayr and Moosauer (2021) findings, which showed that the Eco-score directs consumers towards choosing more sustainable and organic products. Findings of the questionnaire supported the first hypothesis; presence of the Eco-score on packages positively impacts sustainable decision making. It is interesting to note that when looking at each product category separately (Appendix 2, Table 3-10), the presence of the Eco-score only has a significant positive influence in the pizza and granola product category. In the yoghurt and chips product category the influence is not significant, and sustainable product choice even slightly decreases with presence of the Eco-score. It may be the case that these variations exist because of differences in purchase frequency. As visible in Figure 1 in Appendix 2, chips and yoghurt get purchased mostly weekly by participants. Pizza and granola, on the other hand, are bought less frequently. Based on these results, it could be suggested that consumers may be less willing to change their habits for products they buy often, and that they have less trouble adjusting their habits for products they buy less often and probably value less. This corroborates with the ideas of Joshi and Rahman (2015), who suggested in their literature review that habits indeed have a negative influence on green purchase behaviour. Consumer preferences and their purchasing behaviour are influenced by habits and past behaviours, which makes it difficult to change towards sustainable behaviour. Another possible explanation of why the Eco-score only had a significant positive influence in the pizza and granola product category can be linked to consumers' perceptions of green products. Consumers often perceive environmentally friendly products as being more expensive and/or of lower grade compared to regular products (Chang, 2011). Consumers are often unwilling to buy green products when factors like price, value and quality need to be sacrificed. (Chikosha & Potwana, 2021). It is possible, therefore, that consumers don't want to make sacrifices for products they frequently buy, but are open to make sacrifices for products they buy less often.

Not only the first, but also the second hypothesis is confirmed in this research. The results of this study indicate that presence of the Eco-score positively influences consumer awareness of sustainability. These results are in accord with literature, indicating that with the use of sustainable FOP labels, consumers can make more informed decisions and have an increased sustainable awareness (Camilleri et al., 2019). The Eco-score is specifically developed to guide consumers towards sustainable decisions, and the intended impact of the developers of the label can be confirmed with this study (*Eco-score*, 2022).

The increased consumer awareness caused by the Eco-score did, however, not lead to more sustainable decisions. Therefore, the third hypothesis, which stated that consumer awareness of sustainability positively influences sustainable decision making, cannot be confirmed. This finding is therefore contrary to results from previous research which suggested that the generation consumer awareness is an important factor for responsible consumer behaviour (Buerke et al., 2016; Hansen and Schrader, 1997). It is in fact interesting to note that this study found the opposite, and thus that consumer awareness of sustainability had a significant negative impact sustainable decision making. This finding suggests that consumers with greater environmental awareness of the products, might avoid the most sustainable products. One possible explanation for this would be that despite of their sustainability awareness, consumers do not believe in their capability to effectively contribute to addressing environmental issues (Buerke et al., 2016; Cleveland et al., 2012). According to the literature, those who purchase sustainable

products hold considerably stronger beliefs about the impact of their actions compared to non-environmentally conscious consumers (Gupta & Ogden, 2009). Thus, according to the literature, without the belief in being able to make a difference, sustainability awareness does not lead to more green choices. Another possible reason why sustainability awareness has not led to sustainable decision making in this study, can be linked to the perceptions consumers have of green products. As mentioned earlier, consumers don't want to sacrifice factors such as quality, value and price to buy green products (Chikosha & Potwana, 2021). In the case of this study, participants were not exposed to factors such as price, quality and value. However, the perception of these factors related to green products may have caused participants to avoid the most sustainable product options. The last possible explanation why awareness did not lead to sustainable decision making that will be mentioned concerns trust in labels. In their literature review, Joshi and Rahman (2015) mention that green buying behaviour gets hindered by lack of trust in green products. Studies also found that consumers do not trust eco-labels and certification (Gorton et al., 2021; Joshi & Rahman, 2015). If consumers don't trust the information provided, eco-labelling, and thus the Eco-score, may not affect their green purchasing behaviour.

The results of this study confirmed the fourth hypothesis, as results showed that the effect of the Eco-score on sustainable decision making was stronger in the healthy product category (compared to the unhealthy product category). These results are in line with literature about the altruistic and egoistic mindset, which states that food choices depend on the activation of a certain mindset (Kareklas et al., 2014). In this study it was expected that when people are shopping in an unhealthy product category, they are placed in an egoistic mindset and pay less attention to the Eco-score. Besides, it was expected that when people are shopping in a healthy product category, they are placed in an altruistic mindset and pay more attention to the Eco-score. The results are in line with the expectations. Nevertheless, the difference in effect between the healthy and unhealthy product category is bigger than hoped for. It is important to realise that no significant relation between presence of the Eco-score and sustainable decision making was found in the unhealthy product category. This should be further explored, which will be discussed in Chapter 5.3. Although the effect of the Eco-score on sustainable decision making is stronger in the healthy product category, the percentage of sustainable decisions is still higher in the unhealthy product category. A possible explanation for this could be that participants confused the Eco-score with the Nutri-score. This is also something that has emerged from personal communication with participants of the study, who expressed their confusion between the two labels. As mentioned in the introduction, the design of the Eco-score is indeed based on the design of the Nutri-score, which is a label that guides consumers towards more healthy food choices (Egnell et al., 2018; Julia et al., 2016). In the second chapter, the concept of heuristics was discussed. Heuristics are rules of thumb employed by individuals to make decisions (Scheibehenne et al., 2007). It is possible that the used design of the Eco-score fostered heuristics similar to those consumers use for the Nutri-score, for example by the word 'score', the letters A, C and E and the traffic light colours. The percentage of sustainable decisions was bigger in the unhealthy product category, suggesting that people who confused the two scores made 'healthier' choices when the label was present. This idea is in line with results from Aschemann-Witzel et al. (2013) and Julia et al. (2016), who found that the effectiveness of the Nutri-score differs between food categories. Research on the combination of the Eco-score and Nutri-score on packages has been carried out by De Bauw et al. (2021). In their paper, however, confusion between the two scores is not mentioned. This requires further investigation, which is discussed further in Chapter 5.3.

Alongside the four hypothesis, one manipulation check was carried out and two control variables were tested. The variable consumer visual attention served as a manipulation check, and it was confirmed that participants paid attention to the Eco-score when present. The remaining control variables were also investigated, and should be held constant within the research. The first control variable, consumer characteristics, was held constant as there were no differences in consumer characteristics between the three participant groups. It was not achieved to keep the second control variable, packaging attractiveness, constant. The attractiveness rating of the three products was significantly different in the pizza and granola product category. Only in the chips product category, packaging attractiveness was related to sustainable decision making. The reason behind this could be attributed to the fact that the chips package with an Eco-score A was considered the most appealing. However, packages within the chips product category were assessed as equally attractive by participants since the attractiveness scores did not differ significantly. Another possible explanation could be based on the difference in colours of the three chips packages. In the Netherlands, the colour red is associated with natural sea salt potato chips, but one of the packages was completely light blue and one was half blue (see Appendix 1). The (light) blue packaging may have evoked other associations than the red packaging would, such as paprika taste or a 'light' version with fewer calories. The colour associations may have influenced choice behaviour, making the results rather difficult to explain.

## 5.2 Practical Implications

Results of this study show the great potential of the Eco-score in shifting consumer decision making towards more sustainable ones. Besides, as the Eco-score provides consumers with information, it creates consumer awareness of sustainability. However, the success of the transition to a circular economy not only relies on changing the behaviour of consumers, but also manufacturers and producers (Meis-Harris et al., 2021). According to Meis-Harris et al. (2021), a circular economy can only be promoted if manufacturers and producers utilize labels and adhere to the label's requirements and expected outcomes. This study serves as a steppingstone for more research on the Eco-score (see Chapter 5.3 for suggestions for future research). When other studies repeatedly confirm the effectiveness of Eco-score, efforts should be made to improve translation between research, policy and practice. Through the Eco-score, manufacturers can, for example, be encouraged to redesign existing products to sustainable ones and develop new sustainable products (Rubik et al., 2007). Adoption of the Eco-score could also offer competitive advantages or increase market shares for companies (Rex & Baumann, 2007). Nonetheless, companies might not be interested in voluntary implementing the Eco-score, unless they are associated with mandatory (legislated) labelling prerequisites (Meis-Harris et al., 2021). However, obligation is not easy as there are many food chain parties involved in the calculation of the Eco-score that do not yet have their LCA data clear or publicly available (*Eco-score*, 2022). In short, through this and a number of other studies, the first steps have been taken but there is still a long way to go before the Eco-score can be widely implemented in the Netherlands.

## 5.3 Limitations and Future Research

The study is subject to some limitations, from which suggestions for follow-up research emerge. First, a questionnaire was used to for this study to test influence of Eco-score on consumers' sustainable decision-making behaviour. This questionnaire was completed by 273 respondents, thus achieving the target sample size. However, the sample is not representative of the Dutch population, as the sample is biased towards women, age group 18-25 and highly educated people. Although these sociodemographic characteristics were equal among the three participants groups, the overall results of this study cannot be generalised to the entire Dutch population. Further research should be carried out on a sample more representative to the Dutch population to establish more generalisable results.

Second, because the study was carried out through an online questionnaire, the purchase situation was not realistic for both online and especially brick-and-mortar grocery stores. Besides, in realistic grocery shopping scenario's, consumers can choose from more than three products in two or four product categories. Further research should be undertaken to explore if presence of the Eco-score on packages also impacts sustainable decision making in more real-life scenarios.

Third, the questionnaire had a longer duration for the control group, who had to answer questions for all four product categories instead of two. This may have caused fatigue or boredom in this group, causing the questions to be completed less acutely at the end. The fact that respondents in the control group had to answer more questions than the treatment groups has another implication, namely that this design involves repeated measures. This was taken into account in data analysis by splitting all answers into separate responses. This, however, causes characteristics of participants of the control group to count more often, giving their answers more power in the analysis. This was avoided where possible, but in certain data analyses this solution was applied. Although this cannot be entirely justified, the repeated measures do equate to a realistic shopping situation, where consumers also often buy more than one product while doing groceries. However, it is important for future research that it is handled in a more statically sound manner.

A number of interesting topics for future Eco-score research emerged from the preceding discussion. The first topic that has emerged from this study is the consumer trust in the Eco-score. Research shows the importance of trust in labels and certificates for their use in choice behaviour (Gorton et al., 2021; Joshi & Rahman, 2015). The Eco-score was developed quite recently and has not been introduced widely to the Dutch market yet (*Eco-score*, 2022). It is important to assess whether consumers trust the label and to possibly devise strategies to increase this trust. Another interesting topic to further investigate is the impact of the product category on the effectiveness of the Eco-score. As the activation of an egoistic mindset is expected to withhold people from relying on the Eco-score in their decision making, it would be useful to develop strategies to change this. Finally, it remains unclear whether there is confusion for consumers between the design of the Eco-score and Nutri-score after literature review and conduct of the current study (De Bauw et al., 2021). To achieve the potential positive health and environmental impact of both scores, it is important that consumers do not confuse them. Further research could be undertaken to investigate this.

# 6 Conclusion

This study sought to answer the questions 'To what extent does the Eco-score impact consumer decision making towards more sustainable options?' and 'Does the product category affect the effectiveness of the Eco-score on sustainable decision making?'. For this purpose, a quantitative study was conducted through an online questionnaire.

The questionnaires findings indicate that the presence of an Eco-score on packaging leads participants to select products with an Eco-score A more frequently than those in the group without the Eco-score (23% in control group versus 36% in treatment groups). Participants who encounter the Eco-score are thus inclined towards choosing sustainable products. Also, presence of the Eco-score leads to more consumer awareness of sustainability. As a matter of fact, participants who were exposed to the Eco-score found it easier to assess the sustainability of products than participants who were not exposed to the Eco-score (mean of 4.1 for the control group and 5.3 for the treatment groups on a scale from 1 to 9). Nevertheless, this awareness did not directly lead to sustainable decision making. Therefore, consumer awareness of sustainability does not mediate the relation between presence of the Eco-score and sustainable decision making. The moderating effect of the healthfulness of a product category was also investigated through the questionnaire. Findings supported the expectation that the influence of the Eco-score on sustainable decision making was stronger in the healthy product category, compared to the unhealthy product category (Cramer's V output of $V = .204$ for the healthy product category and $V = .082$ for the unhealthy product category).

In conclusion, the quantitative research revealed that the influence of the Eco-score extends to directing consumer decision-making towards sustainable options. While presence of the Eco-score increases consumer consciousness regarding sustainability, awareness does not mediate the relationship between presence of the Eco-score and sustainable decision making. Besides, it was shown that the product category moderates the effectiveness of the Eco-score on sustainable decision making, as the effect of the Eco-score on sustainable decision making was found to be stronger in the healthy product category.

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# Appendix 1: Product Categories and Corresponding Products

Pizza margherita (unhealthy)




Sea salt potato chips (unhealthy)




Red fruit granola (healthy)




Yoghurt (healthy)



# Appendix 2: Detailed Statistical Data

## Description of the sample

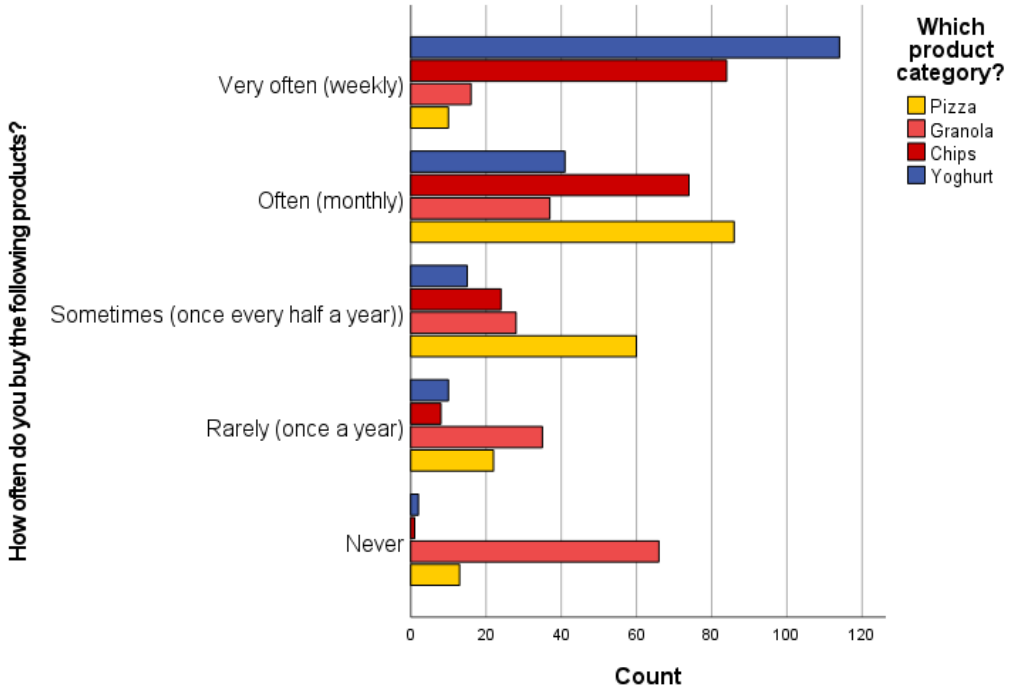


*Figure 1: Purchase Frequency per Product Category*

## Presence/absence of Eco-score

### *All product categories*

*Table 1: Crosstabulation Product Choice * Participant Group*

| | | Participant group | | | |
|---|---|---|---|---|---|
| | | Control Group | | Treatment Groups | |
| | | Count | Column N % | Count | Column N % |
| Product choice all | Eco-score A | 87 | 23,1% | 133 | 35,9% |
| | Eco-score C | 149 | 39,6% | 131 | 35,4% |
| | Eco-score E | 140 | 37,2% | 106 | 28,6% |

*Table 2: Chi-square Test Product Choice * Participant Group*

| | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 15,427[a] | 2 | <,001 |
| Likelihood Ratio | 15,513 | 2 | <,001 |
| Linear-by-Linear Association | 13,671 | 1 | <,001 |
| N of Valid Cases | 746 | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 109,12.

### *Pizza product category*

*Table 3: Crosstabulation Sustainable Decision Pizza * Participant group*

| | | Particpant group | | | |
|---|---|---|---|---|---|
| | | Control group | | Treatment group unhealthy | |
| | | Count | Column N % | Count | Column N % |
| Sustainable Decision - Pizza | Yes | 18 | 19,1% | 40 | 41,2% |
| | No | 76 | 80,9% | 57 | 58,8% |

*Table 4: Chi-square test Sustainable Decision Pizza * Participant Group*

| | Value | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|
| Pearson Chi-Square | 11,015[a] | 1 | <,001 | | |
| Continuity Correction[b] | 9,995 | 1 | ,002 | | |
| Likelihood Ratio | 11,234 | 1 | <,001 | | |
| Fisher's Exact Test | | | | <,001 | <,001 |
| Linear-by-Linear Association | 10,957 | 1 | <,001 | | |
| N of Valid Cases | 191 | | | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 28,54.

b. Computed only for a 2x2 table

### *Granola product category*

*Table 5: Crosstabulation Sustainable Decision Granola * Participant Group*

| | | Particpant group | | | |
|---|---|---|---|---|---|
| | | Control group | | Treatment group healthy | |
| | | Count | Column N % | Count | Column N % |
| Sustainable Decision - Granola | Yes | 11 | 11,7% | 43 | 48,9% |
| | No | 83 | 88,3% | 45 | 51,1% |

*Table 6: Chi-square test Sustainable Decision Granola * Participant Group*

| | Value | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|
| Pearson Chi-Square | 30,079[a] | 1 | <,001 | | |
| Continuity Correction[b] | 28,325 | 1 | <,001 | | |
| Likelihood Ratio | 31,522 | 1 | <,001 | | |
| Fisher's Exact Test | | | | <,001 | <,001 |
| Linear-by-Linear Association | 29,914 | 1 | <,001 | | |
| N of Valid Cases | 182 | | | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 26,11.

b. Computed only for a 2x2 table

### *Chips product category*

*Table 7: Crosstabulation Sustainable Decision Chips * Participant Group*

| | | Particpant group | | | |
|---|---|---|---|---|---|
| | | Control group | | Treatment group unhealthy | |
| | | Count | Column N % | Count | Column N % |
| Sustainable Decision - Chips | Yes | 39 | 41,5% | 34 | 35,1% |
| | No | 55 | 58,5% | 63 | 64,9% |

*Table 8: Chi-square test Sustainable Decision Chips * Participant Group*

| | Value | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|
| Pearson Chi-Square | ,838[a] | 1 | ,360 | | |
| Continuity Correction[b] | ,587 | 1 | ,443 | | |
| Likelihood Ratio | ,838 | 1 | ,360 | | |
| Fisher's Exact Test | | | | ,375 | ,222 |
| Linear-by-Linear Association | ,834 | 1 | ,361 | | |
| N of Valid Cases | 191 | | | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 35,93.

b. Computed only for a 2x2 table

### *Yoghurt product category*

*Table 9: Crosstabulation Sustainable Decision Yoghurt * Participant Group*

| | | Particpant group | | | |
|---|---|---|---|---|---|
| | | Control group | | Treatment group healthy | |
| | | Count | Column N % | Count | Column N % |
| Sustainable Decision - Yoghurt | Yes | 19 | 20,2% | 16 | 18,2% |
| | No | 75 | 79,8% | 72 | 81,8% |

*Table 10: Chi-square test Sustainable Decision Yoghurt * Participant Group*

| | Value | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|
| Pearson Chi-Square | ,121[a] | 1 | ,728 | | |
| Continuity Correction[b] | ,025 | 1 | ,873 | | |
| Likelihood Ratio | ,121 | 1 | ,728 | | |
| Fisher's Exact Test | | | | ,851 | ,437 |
| Linear-by-Linear Association | ,120 | 1 | ,729 | | |
| N of Valid Cases | 182 | | | | |

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 16,92.

b. Computed only for a 2x2 table