DESIGNING FOR PACKAGING SUSTAINABILITY. THE EFFECTS OF APPEARANCE AND A BETTER ECO-LABEL ON CONSUMERS' EVALUATIONS AND CHOICE

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ABSTRACT

The environmental burden of packaging is huge. However, redesigning packaging to make it more sustainable without damaging its other functions is not always easy and can have a negative impact on consumers' choice. In this paper, we adopt a user-perspective and test the effects of packaging appearance and a better eco-label on consumers' responses. Based on the literature, we designed an eco-label using a traffic light system with an objective sustainability score enabling to compare the sustainability of different packages. The results of our experimental study (N=120) show that while a sustainable (vs. typical) appearance in packaging has a positive effect on perceived sustainability, it has a negative effect on perceived usability. However, we demonstrate that the presence of a high score on the eco-label positively impacts the perceived sustainability of both the sustainable and the typical packages and the choice intentions. This eco-label also enabled to mitigate the negative effects of the sustainable appearance on perceived usability. Designers and policy-makers can use the results of this paper to positively influence evaluations of and choice for sustainable packaging.

Keywords: Packaging, Sustainability, Eco-label, Ecodesign, Communication

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1 INTRODUCTION

Design plays an important role in the perception of sustainable packaging. Research has shown that consumers' awareness of the importance of packaging sustainability has increased over the years (Nordin & Selke, 2010; Schwepker & Cornwell, 1991). However, consumers are not satisfied with the current ways of communicating sustainability by retailers (Rützler & Reiter, 2014), who often find claims misleading (Kahle & Gurel-Atay, 2013). New packages and eco-labels explaining sustainability should be designed using a user-centred approach. By doing so, user perceptions and evaluations are taken into account and can ultimately influence buying behaviours towards more sustainable alternatives.

When improving packaging sustainability, companies face two majors options, which both comprise risks. On the one hand, they can alter the appearance of the package by changing the material (e.g. replacing a plastic bottle by a cardboard package), which can result in consumers having more difficulties to categorise a product (Schoormans & Robben, 1997) and possibly in perceived usability issues (Mugge & Schoormans, 2012). On the other hand, they can keep the same appearance by enhancing the sustainability of the material (e.g. by using recycled plastic or gas injection in the production method of a plastic bottle), and run the risk that consumers do not perceived the improvements in sustainability (Magnier & Schoormans, 2015).

Whether companies decide to change the material and the appearance of their packaging or they improve the sustainability of their package while keeping the appearance the same, they need to communicate in order to clarify their intention in terms of sustainability (Magnier, Schoormans & Mugge, 2016; Magnier & Crié, 2015). One way to communicate packaging sustainability is to use eco-labels. Eco-labels can ease consumers' comprehension of packaging sustainability. They can help categorisation (Magnier & Schoormans, 2015) and therefore make it easier for consumers to choose a more sustainable packaging alternative. In addition, eco-labels are especially useful to convey the level of sustainability of a packaging with a typical appearance (i.e. made of materials that do not appear to be sustainable at first). However, eco-labels and environmental claims in general are often miscomprehended and lead to consumer skepticism. This effect is less strong when environmental claims are certified by trustworthy third-party organisations (Bickart & Ruth, 2012). Eco-labels using a traffic light grading system to communicate packaging sustainability seem to represent a good alternative as they enable to clarify whether the package has a low, medium, or high level of sustainability and to compare the sustainability of different packages on the same criteria (Grunert & Wills, 2007; Thøgersen & Nielsen, 2016). In this paper, we aim to investigate how packaging appearance (typical vs. sustainable) and an eco-label with a traffic light grading system (presenting either a low or a high grade) interact to influence consumers' perceptions of sustainability, usability, expensiveness and purchase intention.

This research contributes to the literature in the field of packaging design. Designers can use the results of this paper to design sustainable packaging, and to influence consumers' perception of environmental sustainable packaging. Furthermore, this paper adds to the literature in the field of marketing and eco labels by providing new insights into how eco-labels are perceived and how they influence the perception of sustainability depending on packaging appearance. In addition, the results of this paper can be used by policy-makers in order to facilitate consumers' choice for more sustainable packaging by providing them objective and comparable information about packaging sustainability.

2 THEORETICAL BACKGROUND AND HYPOTHESES

2.1 Importance of sustainable packaging

Packaging is an important element to consider in order to decrease the ecological footprint of a product (Magnier & Schoormans, 2015). In this paper we define packaging sustainability as the attempt to reduce the environmental footprint of a package (Magnier, Schoormans & Mugge, 2016). Although the environmental burden of packaging is huge, it is unlikely to be eliminated due to the many benefits it provides (e.g. conservation and preservation, transportability, improved usability of

products). Companies and manufacturers need to innovate in this domain in order to fulfil the sustainability and circularity requirements that many governments have established. At the same time, consumers often pinpoint packaging as a real environmental burden and companies need to show their involvement in solving this issue in order to remain competitive (Magnier & Crié, 2015). Therefore, designers need to address the functional aspects of packaging and importantly they need to make it less detrimental for the environment. To truly have a positive impact, consumers need to choose for these sustainable packages, and it is therefore important to understand packaging sustainability from a consumer point of view. Indeed, changes in packaging design need to be carefully conducted as it remains essential in the evaluation and purchase decision of fast moving consumer goods (Jakupov & Kacalov, 2003). As most consumers are not familiar with concepts and terminology of sustainable packaging and fail to make sustainable packaging choices when there is no explicit information about the environmental consequences of the package (Rokka & Uusitalo, 2008), it is important to communicate packaging environment-friendliness in a way that consumers easily understand.

Sustainability in packaging can be communicated via structural, graphical and informational cues (Magnier & Crié, 2015). Structural cues are related to the structure of the package (e.g. materials, size, shape). Graphical cues are visually displayed colours or logos that communicate sustainability. Informational cues relate to the information such as numerical and verbal claims displayed on the package (e.g. level carbon footprint). Structural and graphical cues often need to be accompanied by explicit verbal information in order to be fully understood by the consumer (Magnier & Crié, 2015).

2.2 Influence of cues of sustainability on perceived packaging sustainability

Literature has demonstrated that the visual appearance of a package has a strong influence on consumers' perception of packaging sustainability (Magnier & Crié, 2015; Magnier & Schoormans, 2015; Steenis et al., 2017). In order to choose for a sustainable package, consumers need to be able to make the right categorization, namely: is the package sustainable or not? Consumers can only do this categorization correctly when there are clear cues indicating that the package is sustainable (Magnier & Schoormans, 2015). Therefore it is unlikely that a consumer will recognize a conventional looking package as being a sustainable package unless an ecological character is given to the package. Designers can give an ecological character to the package by using for example recycled materials or adding an eco-label (Magnier & Crié, 2015).

A package with a sustainable appearance is defined as a package that makes use of organic materials and has a sustainable look (e.g. packaging made of a paper-based material) (Lindh, Olsson & Williams, 2016). Research has demonstrated that consumers use material appearance to evaluate packaging sustainability and that these organic material with a cardboard-like appearance are often considered the most sustainable (Magnier & Schoormans, 2015). But not all sustainable packages are easily recognisable. Some packages are designed to be sustainable but it is difficult to recognise it from their physical appearance. Packages made of recycled plastic or packaging containing less plastic due to innovations in gas injection are examples of a sustainable package with a conventional appearance (Magnier & Schoormans, 2015). Consequently, we formulate the following hypothesis:

H1a: The sustainability of the package will be perceived as higher when the package has a sustainable (vs. typical) appearance.

Many studies have examined the effects of eco-labels on the perception of package sustainability (Magnier & Crié, 2015; Bickard & Ruth, 2012; Magnier & Schoormans, 2015; Rettie & Brewer, 2000; Obermiller & Spangenberg, 1998; Thøgersen & Nielsen, 2016; Van Dam & De Jonge, 2015). The visual appearance is not the only way to convey packaging sustainability. Graphical and informational cues, such as eco-labels, can help consumers recognise packaging sustainability when it is not directly recognisable (Rettie & Brewer, 2000; Magnier & Crié, 2015). However, consumers are often skeptical towards eco-labels.Thøgersen and Nielsen (2016) have demonstrated that eco-labels using a traffic light system and objective numerical information seem to lead to better comprehension and acceptance by consumers. In this study, we expect that a high sustainability score on a traffic light-like eco-label, will have a positive effect on perceived sustainability:

H1b. A high score (vs low score) on the eco-label will have a positive influence on the perceived sustainability.

2.3 Influence of cues of sustainability on perceived usability

Packaging fulfils different functions such as providing information and communication, transportability, protection and conservation, and therefore improving the overall product usability (Rundh, 2005). Although packaging sustainability is important, consumers will choose for a package if they believe it will fulfil their needs. When redesigning a package to make it sustainable, it is therefore important to make sure that the other functions of the packaging are not damaged. Literature has shown that packaging typicality strongly influences categorisation and subsequent evaluations (Schoormans & Robben, 1997). Precisely, when a packaged product is too atypical, it runs the risk to be evaluated more negatively (Hekkert, Snelders, & Van Wieringen, 2003) because individuals may wrongly categorise it. Moreover, literature also demonstrated that novel and atypical designs may result in decreased perceived usability (Mugge & Schoormans, 2012; Mugge & Dahl, 2013). The redesign of a packaging to make it more sustainable may involve a radical change in appearance. The new design may differ from the prototypical design in the category and damage perceived usability. Consequently, we formulate the following hypothesis:

H2: The perceived usability of a product will be more positive when the package has a typical (vs. sustainable) appearance.

2.4 Influence of cues of sustainability on perceived expensiveness and purchase intention

Literature has shown that atypical products are generally associated with exclusiveness and therefore expensiveness (Creusen & Schoormans, 2005). Moreover, sustainability in packaging is often associated with higher quality and in turn a higher price (Magnier & Crié, 2015; Magnier, Schoormans & Mugge, 2016). Therefore, we expect that the sustainable and atypical packaging appearance will be perceived as more expensive when compared to the typical packaging and formulate the following hypothesis:

H3a. Perceived expensiveness will be higher when the package has a sustainable (vs. typical) appearance.

However, literature has shown that consumers are willing to pay a higher price for products that include sustainable information because they believe that higher production costs are associated to efforts in the domain of sustainability (Meise, Rudolph, Kenning, & Phillips, 2014). Correspondingly, we expect that a high score on an eco-label that enables comparison between packages will have a positive impact on the perceived expensiveness of packages with a typical appearance:

H3b. A high score will have a positive effect on the expensiveness perceptions of the package with a typical appearance while it will not have a significant impact for the package with a sustainable appearance.

When only considering the sustainable appearance of the packaging, consumers may face trade-offs related to the increased perceived sustainability of the packaging on the one hand (Magnier & Schoormans, 2017) and the decreased perceived usability on the other hand (Mugge & Schoormans, 2012; Mugge & Dahl, 2013). Therefore, we expect that there will not be a significant difference of purchase intention between the sustainable and the typical packages and we formulate the following hypothesis:

H4a. There is no significant effect of the packaging appearance on purchase intention.

However, reinforcing the appearance of the package by an eco-seal that enables the comparison of the sustainability of a package, such as a traffic light with objective information (Bickart & Ruth, 2012; Grunert & Wills, 2007; Thøgersen & Nielsen, 2016) may have a positive influence on purchase intention. We therefore formulate the following hypothesis:

H4b. There is a significant effect of the sustainability score on purchase intention. A high (vs. low) score will lead to higher purchase intention.

3 METHOD

3.1 Procedure and sample

In this study, we used a 2 (sustainability score: low vs. high) × 2 (packaging : typical appearance vs. sustainable appearance) between-subject experiment. Participants were recruited within the network of the authors and through a snowball procedure. In total, 120 participants living in the Netherlands (age range between 17 and 80 years, M(age) = 29.89, SD(age)= 14.3 years, female: 60,8%) completed the study. Each participant was presented with one of our four stimuli and asked to answer a series of questions regarding the stimulus and their individual characteristics.

3.2 Design of the stimuli

We chose a water bottle as a product category to develop our stimuli. We chose this product category for 3 main reasons. First, water is a commonly bought product that is familiar to everyone. Second, water bottles have a typical packaging (i.e. a transparent plastic bottle) and very few brands deviate from this packaging. Third, water bottles have often been pointed out as problematic for the environment (Laville & Taylor, 2017). In total, we created four different bottles of water corresponding to the four different conditions.

In order to manipulate the appearance of the packaging, we used a typical transparent plastic bottle for the typical appearance and a dull brown cardboard package for the sustainable appearance (Magnier & Crié, 2015). This brown and opaque cardboard package can be considered non typical compared the majority of water bottle designs sold in the country where the experiment took place. We kept other elements of the package constant (e.g. plastic cap, squared shape) to avoid potential confounding effect on usability.

In order to manipulate the sustainability score, we designed a logo that included both graphical and informational cues (cf. figure 1). The designed eco-labels both display informational and graphical cues in order to decrease scepticism (Obermiller & Spangenberg, 1998). This eco-label represented a package with leaf as graphical cue since this is associated with nature and therefore has a close relationship with environmental impact (Magnier & Crié, 2015), and information about the sustainability. Information displayed on the package was material, carbon footprint and a standardized score for the environmental impact. The verbal text on the eco-label was the same for all packages (*"Score of package sustainability is based on the carbon footprint of the package, recyclability of used material and energy and water used to produce this package. With this information we hope that you will make better choices."*). The standardized score was placed on the eco-label to ease the processing of information by consumers (Vlaemink, JIang & Vranken, 2014). The score displayed on the package was either high (8.2) or low (4.5). This score was placed next to a gradient going from red to green. The low score was place on the red side of this gradient while the high score was placed on the green side of this gradient. Eco-labels were designed in Adobe Illustrator CC 2018, and the looks of packages were manipulated in Adobe Photoshop CC 2018.

Figure 1: Eco-labels with low (left) and high (right) sustainability scores

3.3 Measurements

Participants were first asked to carefully evaluate one of four bottles in an online study. Next, participants filled in a questionnaire, containing a scale for purchase intention, measured by using three 7-point Likert-statements (Wang, Minor & Wei, 2011; α = 0.89), assessing the likelihood of a consumer to buy the bottle *(If I want to buy a 0.5L water bottle, there is a chance that I buy this product; If I want to buy a 0.5L water bottle, I would consider buying this product; If I want to buy a water bottle, my willingness to buy this product would be high)*. The package expensiveness was measured using one 7-point Likert statement *(This package looks cheap),* which was reverse coded for the analysis. Perceived usability was measured using three 7-point Likert statements (Meuter, Bitner, Ostrom & Brown, 2005; α = 0.89) *(I believe that this package is user-friendly, This package will work properly, I believe that the package is easy to use)*. Then packaging sustainability was measured (α = 0.96) *(This package is environmental friendly, This package is a good example of an environmental friendly package. This package is made with environmental responsible materials)*. Lastly an environmental concern scale (Kilbourne & Pickett, 2008; α = 0.88) was used to check the level of environmental concern of consumers *(I am very concerned about the environment; Humans are severely abusing the environment; I would be willing to reduce my consumption to help protect the environment; Major political changes are necessary to protect the natural environment; Major social changes are necessary to protect the natural environment; Anti-pollution laws should be enforced more strongly)*. This measurement will be used in our analyses to control for the effect of environmental concern in consumer responses. Finally, we asked participants to evaluate the score on the package on a 7-point semantic differential scale (low vs. high) in order to check our manipulations.

4 RESULTS

4.1 Manipulation checks

In order to check whether the sustainability scores were perceived as low and high by our respondents, we performed an independent sample t-test with the evaluation of the score as a dependent variable and sustainability score as an independent variable. The t-test was significant (M(high) = 4.90 vs. M(low) = 3.70, t(118)= 4.516; p < 0.000) and we conclude that our manipulations of the sustainability score were successful. The high score (8.2) was perceived as higher than the low score (4.5).

4.2 Effect of packaging appearance and sustainability score on perceived sustainability

We performed a factorial ANOVA with perceived sustainability as dependent variable and packaging appearance and sustainability score as independent variables. Environmental concern was first entered in the analysis as a covariate but was not significant (p = .42) and was therefore removed from the analysis. Results demonstrated a significant main effect of the packaging appearance on perceived sustainability (M(sustainable) = 5.14 vs. M(typical) = 3.73, F (1,116)= 29.08; p < 0.001, CI [0.877, 1.921]), **which supports H1a**. In other words, this shows that a sustainable looking package has a positive effect on the perception of sustainability.
There was also a significant main effect of the sustainability score on perceived sustainability (M(high) = 5.01 vs. M(low) = 3.87, F (1,116)= 18.80 ; p < 0.001, CI [0.619, 1.659]). From this we conclude that a high score on the package has a positive effect on the perception of sustainability, **which supports H1b**.

4.3 Effects of packaging appearance and sustainability score on perceived usability

Next, we performed an ANCOVA with perceived usability as dependent variable, packaging appearance and sustainability score as independent variables, and the level of environmental concern as covariate. The covariate was significant (F (1,115) = 13.425, p < .001). By including environmental concern as covariate we can control for its influence on the perceived usability, and therefore we can more precisely evaluate the effect of the manipulations. The effect of the package appearance on perceived usability was significant (*M*(typical) = 5.08 vs. *M*(sustainable) = 4.41; *F*(1,115) = 12.870; *p*

<0.01). Precisely, the perceived usability was higher in the typical appearance condition than in sustainable appearance condition, **supporting H2**. Surprisingly, there was another significant main effect is the sustainability score on perceived usability (M(low) = 4.51 vs. M(high)= 4.98 ; F(1,115) = 4.16; p <.05). Adding a high sustainability score on the package helps to increase the perceived usability, and seems to compensate the negative effect of the sustainable appearance on perceived usability (M(sustainable_high)= 4.7444 vs. M(sustainable_low) = 4.200).

4.4 Effect of packaging appearance and sustainability score on perceived expensiveness

Next, we performed a factorial ANOVA with perceived expensiveness as a dependent variable and packaging appearance and sustainability score as independent variables. There was no significant main effect of the appearance (p >.19) and sustainability score (p > .43) on perceived expensiveness. **H3a was therefore not supported**. However there was a marginally significant interaction effect of appearance and sustainability score on the perceived expensiveness (F(1,116) = 3.373 ; p = .07). Pairwise comparisons show that when the score was low, there was no difference in perceived expensiveness between the package with the typical appearance (M(low_typical) = 4.63) and the package with the sustainable appearance (M(low_sustainable) = 4.46) (p >.71). However, when the score was high, the package with a typical appearance (M(high_typical) = 4.30) was perceibed as significantly less expensive than the package with a sustainable appearance (M(high_sustainable) = 5.30) (p < .05). Although they **do not support H3b,** these results show that only packages with a sustainable appearance are perceived as more expensive when they are combined with a high score.

4.5 Effect of packaging appearance and sustainability score on purchase intention

Last, we performed an ANCOVA with purchase intention as a dependent variable, packaging appearance and sustainability score as the independent variables and the level of environmental concern as a covariate. The covariate was marginally significant (F(1, 115) = 3.36, p = .07). A expected, the effect of packaging appearance on purchase intention was not significant (p = .36) **supporting H4a**. However, there was a significant main effect of the sustainability score on purchase intention (M(high) = 4.468 vs. M(low) = 3.66, F(1,115) = 4.22; p < .05, CI [4.089, 4.856]), meaning that the high score on the package led to a higher level of purchase intention, **supporting H4b.**

5 DISCUSSION

5.1 Theoretical implications

The need for more research on consumers' determinants of choice for more sustainable packaging has been acknowledged in past research (Magnier & Schoormans, 2015; Steenis *et al.*, 2017). The present research aimed to address this gap in the literature by examining the effect of packaging appearance (typical vs. sustainable) and a better eco-label (showing either a low or a high sustainability score) on consumers' evaluations and purchase intention. In this study, we demonstrate that while a sustainable appearance has a positive effect on perceived sustainability, it has a negative effect on perceived usability due to its atypicality. This contributes to the literature on the negative effect of atypicality on perceived usability (Mugge & Schoormans, 2012; Mugge & Dahl, 2013). Next, we demonstrate that the presence of a high score on an eco-label that enables to objectively compare the sustainability of different packages has a strong impact on the perceived sustainability of both the sustainable and the typical packages and on choice. This extends the literature on the positive effect of traffic light eco-labels (Thogersen & Nielsen, 2016; Van Dam & De Jonge, 2015) on consumer choice for more sustainable alternatives to the context of packaging sustainability. Interestingly, we show that when this type of label is presented with a high score, it enables to mitigate the negative effect of the sustainable and non-typical appearance (due to its opacity) on perceived usability.

Interestingly, the packaging appearance did not lead to significant differences in perceived expensiveness. Perceived expensiveness can be used as a proxy for perceived quality and past research has shown that a sustainable appearance has a positive effect on the perceived quality of a product (Magnier, Schoormans & Mugge, 2016). In this study, the sustainable appearance of the product was manipulated by changing the plastic bottle to a cardboard package. While making the packaging more

atypical it also made it opaque which can have a negative effect on the perceived quality of water. It is worth noting that associating a high sustainability score to this cardboard packaging has a positive effect on perceived expensiveness. Therefore, we expect that by framing consumers on the sustainability score, it is possible to mitigate the negative effects of the cardboard appearance (e.g. opacity) on perceived expensiveness.

5.2 Practical implications

Packaging designers can use the results of this research when designing more sustainable packages. Specifically, when they decide to radically change the appearance of a product to make it more sustainable, they should keep in mind the potential negative effects on perceived usability.

Since consumers are interested in reducing their carbon footprint by living more sustainably, showing that packages are sustainable is a first step to enable them to categorise packages as sustainable or not. The combination of graphical cues and informational cues into one eco-label represents a good start to communicate packaging sustainability to consumers.

This research shows a significant effect of an eco-label on the perception of sustainability. Governmental institutions and policy makers can therefore use this research to create an eco-label that has a strong impact on consumers' choice for more sustainable packaging. Traffic light-like labels combined with an objective score on sustainability seem to represent an effective option to stimulate choice for more sustainable packaging. Adding such an eco-label to packages will increase the perception of sustainability, perceived usability (of non typical packaging) and purchase intention of consumers.

5.3 Limitations and further research

Our research is limited in several ways. First the questionnaire was distributed online and distractions from the environment of our participants could not be taken into account. Further research could replicate the results of this study by inviting participants to perform the test in a controlled environment in order to control for potential distractions and give the respondents the opportunity to see and feel product they are evaluating.

Next, this study was run in the Netherlands, where individuals generally have a high level of environmental concern. Further research could aim to confirm these results in different contexts where package sustainability is not that important yet.

The sustainability scores where either low (4.5) or high (8.2) and were correctly perceived by our respondents. However, it could be interesting to investigate the threshold score under which consumers do not find a package acceptable, and how this score varies depending on the culture of the respondents.

Further research could as well investigate how packages can be designed to look sustainable, without decreasing the perceived usability. The findings that a high sustainability score has a positive effect on the perceived usability of packages with a sustainable appearance is a good starting point, but more research could be done on this issue.

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