Global Environmental Psychology

PsychOpen GOLD

Research Articles

Check for updates

Design for Behaviour Change — The Influence of Packaging Design on Recycling

Josefine L. Geiger[1§], Rebecca J. Sargisson[2§], A. Berfu Ünal[3], Ellen Van der Werff[1], Linda Steg[1]

[1] *Department of Psychology, University of Groningen, Groningen, the Netherlands.* **[2]** *School of Psychological and Social Sciences, University of Waikato, Tauranga, New Zealand.* **[3]** *Campus Friesland, University of Groningen, Leeuwarden, the Netherlands.*

[§]*These authors contributed equally to this work.*

Global Environmental Psychology, 2025, Vol. 3, Article e12349, https://doi.org/10.5964/gep.12349

Received: 2023-07-05 • **Accepted:** 2024-03-22 • **Published (VoR):** 2025-09-09

Handling Editor: Esther K. Papies, Radboud University, Nijmegen, the Netherlands

Corresponding Author: Rebecca J. Sargisson, School of Psychological and Social Sciences, University of Waikato, Tauranga 3110, New Zealand. E-mail: rebecca.sargisson@waikato.ac.nz

Badges for Good Research Practices: Code. Data. Diversity Statement. Materials.

Abstract

Initial evidence indicates that design can drive socially desirable behaviour change, but little is known about why and under what conditions the effects of design are most likely. We tested whether packaging designs aimed at making people focus on the environment promoted recycling. In Study 1, 380 Dutch citizens viewed either a biscuit package or a cup with or without an environmental design and reported how they would dispose of the item. In Study 2, 104 Dutch university students received a hot beverage in a recyclable cup with an environmental or non-environmental design and we observed whether they disposed of the cup in a recycling bin. While there was no effect of design on the intention to recycle the biscuit package, participants reported that they were more likely to recycle the cup with the environmental design (Study 1), and we observed that they did, in fact, recycle the cup with the environmental design more often than the non-environmental cup (Study 2). We also found a significant interaction effect for the cup conditions: Intention to recycle, and actual recycling, of the environmental cup increased with increasingly strong biospheric values. We discuss implications of our findings.

Keywords

biospheric values, context, design for behavioural change, packaging design, recycling

Non-Technical Summary

Background

People have demonstrated willingness to buy products with sustainable packaging, but recycling rates of sustainable packaging are still very low, and little is known about the design features of packaging that might influence the likelihood that the package is recycled.

We hypothesised that people who moderately value the environment would be the most likely to recycle packaging with designs that make them focus on the environment. We reasoned that people who do not value the environment would be unlikely to recycle regardless of the nature of the packaging, and that those who greatly value the environment would recycle the packaging, even if it did not make them focus on the environment. However, people with moderate environmental values may be more responsive to a packaging design that makes them focus on the environment and ultimately recycle such packaging more often.

Why was this study done?

The study was conducted to discover whether packaging designs that make people focus on the environment are more likely to be recycled than those with non-environmental designs. We were also interested in whether the likelihood of recycling was related to people's biospheric values.

What did the researchers do and find?

In Study 1 we showed people a picture of a biscuit package or a takeout cup with either a standard or an environmental design and asked them whether they would recycle the packaging. People reported that they would be more likely to recycle the cup with the environmental design than the cup without the design, but they were no more likely to recycle the biscuit package with the environmental design. In Study 2, we gave people a beverage in cups featuring the same designs and observed whether they recycled the cup. People were more likely to recycle the cup with the environmental design. Intention to recycle, and actual recycling, of the environmental cup increased with increasingly strong biospheric values.

What do these findings mean?

Packaging designs that make people focus on the environment can be effective at promoting recycling behaviour, particularly for people who hold moderately strong to strong biospheric or environmental values.

Global Environmental Psychology
2025, Vol. 3, Article e12349
https://doi.org/10.5964/gep.12349

Highlights

- Many people are willing to purchase products with recyclable packaging but few actually recycle the packaging.
- We investigated whether products presented with or without packaging intended to make people focus on the environment would increase recycling intentions and behaviour.
- Intention to recycle (Study 1) and actual recycling (Study 2) was higher for a takeout cup with an environmental versus a non-environmental design.
- Biospheric values were not directly predictive of recycling intentions or behaviour.
- Intention to recycle, and actual recycling, of the environmental cup increased with increasingly strong biospheric values.

Consumers are more likely to purchase a product with sustainable than with unsustainable packaging (Magnier et al., 2016; Orzan et al., 2018; Pancer et al., 2017; Steenis et al., 2017), but do consumers recycle the sustainable packaging? Research would suggest not: In an Australian audit, recyclable food packaging comprised 84.3% of household waste (Lehmann, 2015). In Utrecht, in the Netherlands, only 33% of household waste that can be separated for recycling is separated at source by consumers (Hoek, 2019). Added to the low recycling rates is the fact that the amount of packaging waste being generated is increasing, particularly for paper and cardboard, which is the main packaging waste material in the EU (Eurostat, 2024). To achieve the full potential of sustainable packaging, it is pivotal to understand how to encourage consumers' recycling of packaging material (Kirchherr et al., 2017; Wikström et al., 2014).

Research has shown that design can drive socially desirable behaviour change (Peeters et al., 2022; Sauer & Rüttinger, 2004; Tromp et al., 2011; Tromp & Hekkert, 2016). However, little is known about why and under which conditions such effects are most likely. In the small amount of research that exists on how packaging design affects recycling behaviour, some studies report that packaging features are a significant predictor of intention to recycle the packet (Martinho et al., 2015), and other studies suggest that they are not (e.g., Buelow et al., 2010). Information on the packaging does not appear to influence how it is disposed of (Langley et al., 2011), perhaps because consumers do not notice information, logos, and symbols on food packaging (Nemat et al., 2022). However, such research has largely used a non-experimental questionnaire approach (e.g., Buelow et al., 2010; Martinho et al., 2015) or interview methods (e.g., Nemat et al., 2022) and therefore relies on self-reported data that may not reflect actual behaviour very well.

We could find very few experimental studies investigating whether packaging design influences *actual* recycling behaviour. One study attempted to measure recycling behaviour in a supermarket taste test. The researcher placed labels on small plastic cups from which customers could sample juice. The recyclable labels, either displaying a sustaina-

ble design (green with recycling symbols) or a non-sustainable design (orange with no recycling symbols), were meant to be detached from the cup and disposed of — either into a recycling bin or a trash bin. Although none of the labels were found in the trash bin, the presence of a sustainable label did not significantly affect[1] the number of labels or the number of cups with labels still attached that were discarded in the recycling bins. Similarly, there was no significant difference[1] in the number of cups containing sustainable or non-sustainable labels found in the trash bin. However, most customers did not detach the label, perhaps because it was too effortful, or it was not clear to them that the label should be detached (Borgman, 2018). Additionally, disposal choices may have been influenced by other confounding factors. Borgman (2018) suggested that the quality of the label may have caused participants to question whether it was recyclable. Additionally, black text containing recycling instructions may have been more difficult to read on a green background (due to lower contrast) than it would have been on an orange background. Lastly, the author noticed that many cups were visible in the bins. Participants may have conformed to the behaviour of previous customers and thrown the cup into bins without removing the labels as others had done before them. Due to these limitations, the researcher was unable to conclude that the design affected recycling decisions of the supermarket customers (Borgman, 2018) and urged future researchers to conduct more experimental studies in naturalistic settings. We used experimental methods and addressed the limitations of Borgman's (2018) study in examining whether packaging design can influence recycling. In collaboration with designers, we developed packaging designs and evaluated the impact of these packaging designs on intention to recycle and actual recycling of the packaging.

On the basis of the Integrated Framework for Encouraging Pro-Environmental Behaviour (IFEP model; Steg, Bolderdijk et al., 2014, we propose that individuals who are focused on the environmental consequences of their behaviours and on benefiting the environment in a given situation (we refer to this as 'focus on the environment') are more likely to engage in a variety of pro-environmental behaviours, including recycling (Ruepert et al., 2017; Steg, 2016). The IFEP proposes that the extent to which individuals focus on the environment depends on contextual factors and biospheric values (Steg, 2016). Specifically, we hypothesised that packaging design would affect whether people recycled the packaging (**Hypothesis 1**). Biospheric values reflect the extent to which people have the goal to protect nature and the environment, and steer individuals' attention towards value-related consequences of their behaviour, thereby affecting the extent

1) The author did not run statistical tests in the original study. Using the data in Table 4 of the original study (Borgman, 2018), we ran chi-square goodness-of-fit tests and found that the presence of a sustainable label (green) did not significantly increase the number of green labels (N_{green} = 21, N_{orange} = 31, $x^2(1) = 1.92$, $p = .17$) or green cups (with labels still attached; N_{green} = 32, N_{orange} = 30, $x^2(1) = 0.06$, $p = .80$) discarded in the recycling bins compared to labels and cups with the non-sustainable design (orange). There was also no difference between the number of green ($N = 7$) and orange ($N = 8$) cups (with labels still attached) found in the trash bin, $x^2(1) = 0.07$, $p = .80$.

to which people are focused on the consequences of their behaviour for the environment (Perlaviciute & Steg, 2015; Steg, Perlaviciute et al., 2014; Verplanken & Holland, 2002). The stronger individuals' biospheric values, the more likely they are to focus on the environmental consequences of their actions, and to act pro-environmentally, including recycling (**Hypothesis 2**; Feather, 1995; and see Steg & de Groot, 2012, for a review).

Biospheric values may not only directly affect recycling but may also influence the strength of the effect of packaging design on recycling. In particular, and in line with the ABC model (Guagnano et al., 1995; Stern & Oskamp, 1987), we propose that the effect of packaging design on recycling will be more pronounced among individuals with moderate biospheric values. The ABC model predicts an inverted U-shaped relationship between internal predictors of behaviour, such as personal norms and values, and external predictors of behaviour, such as the cost or difficulty of the behaviour (Keizer et al., 2019), or in our case, the design features of the packaging. In our study, the environmental packaging was expected to have the greatest effect on people with moderate biospheric values. Individuals with strong biospheric values are already likely to be focused on the environment and thus recycle because doing so is very important to them. Therefore, people with strong biospheric values would recycle regardless of the design of the packaging. Individuals with weak biospheric values do not care much about the environmental impact of their actions and are therefore not likely to be focused on the environmental consequences of their behaviour and to recycle, even when a design aims to make them focus on the environment. However, individuals with moderate biospheric values may be more responsive to a packaging design that makes them focus on the environment, as they care about the environment, but may not always focus on the environmental consequences of their behaviour. Hence, we expect an interaction between packaging design and biospheric values, specifically, that the effect of packaging design on recycling will be more pronounced among individuals with moderate biospheric values (**Hypothesis 3**; cf. Guagnano et al., 1995; Ruepert et al., 2017).

To develop the packaging, we explained our theoretical reasoning to a designer that we expect that a design can promote recycling when it makes people focus on the environment. In Study 1a, the designers translated our theoretical input into a new package for biscuits available in Dutch supermarkets at the time; the existing package served as our control (non-environmental) condition (Figure 1). The new design was aimed at encouraging individuals to focus on the environment; we refer to this as the 'environmental' design. In Study 1b, the designer produced two versions of a takeout coffee cup (i.e., environmental vs. non-environmental design; Figure 1). It was our intention to ensure a strong manipulation, so that rather than compare an environmental design with a "control" of a more neutral design, we sought to ensure that participants would pay attention to both types of design — one that makes people focus on the environment, and one that does not. To do this, we ensured that both types of design were attractive and,

in the case of the cups, novel (both were both different to the cups available from the coffee machines on campus or to plain white takeout cups). We pre-tested the designs with students from our environmental psychology class who confirmed that all designs were attractive and that the recyclability of both packages was clear. We conducted a questionnaire with a representative sample of the Dutch population to examine their reported likelihood of recycling the packaging (Study 1). In Study 2, we conducted a field experiment in which a sample of university students received a beverage in one of the two cups used in Study 1, and we observed whether they recycled the cup. We did not produce a physical copy of the biscuit packages due to the difficulty in doing so, and thus Study 2 was conducted with the cups only. For each study, we included measurements of the participants' biospheric values to examine whether the effect of packaging design was more pronounced when biospheric values were moderate.

Figure 1

Non-Environmental Biscuit Packet and Cup (left) and Environmental Biscuit Packet and Cup (right)

Note. Non-Environmental cup (left) and environmental cup (right) used in Studies 1 and 2.

Thus, our hypotheses were:

H1: Packaging design will affect whether participants recycle. Participants will both report that they are more likely to recycle *(Study 1)* and they will actually recycle *(Study 2)* packaging with the environmental designs more than those with the non-environmental designs.

H2: Biospheric values will be positively related to intention to recycle and actual recycling.

H3: There will be an interaction between biospheric values and packaging design. The effect of packaging design on intention to recycle and actual recycling will be strongest for participants with moderate biospheric values.

Method

Ethics

Prior to data collection, the Ethics Committee of Psychology (ECP) of the University of Groningen approved the research (16221-S-N and 17107-S-NE). Informed consent was obtained from all participants prior to commencement of each study, and all studies adhered to current European Union ethical guidelines for research with human participants.

Participants

Study 1

Study 1 participants were a sample of people representative of the Dutch population (Study 1a: n = 187, M_{age} = 56.65, SD_{age} = 13.66; 47.9% women; Study 1b: n = 193, M_{age} = 56.88, SD_{age} = 14.94; 46.5% women). Participants were randomly assigned to the biscuit or the cup condition and then to the environmental or the non-environmental design condition. We aimed for 75 participants per condition (total n = 300). As it was a paid sample, we based our sample size on a cost-benefit analysis aiming for a balance between cost and per-condition sample size. We did not run a priori power analyses, but we conducted a post hoc sensitivity analysis in G*Power after data collection. For Studies 1a and 1b, the sensitivity analysis showed that the smallest effect (Cohen's f^2) that could have been detected[2] with three predictor variables, α = .05, power of .8, and a sample size of 193 was .06.

2) According to Cohen's effect-size guidelines, a small effect size for f^2 is 0.02 and a medium effect size is 0.15 (Cohen, 1992).

Study 2

In Study 2, 104 Dutch first-year psychology university students (M_{age} = 20.33, SD_{age} = 3.93; 69.3% female) participated for course credits. The sample size was restricted by the labour-intensive nature of the study and by the fact that the rooms were only available for a 2-week period. The sample size was originally 109 students, but five students refused a drink and their data were removed prior to analysis. We did not run a priori power analysis, but we conducted a post hoc sensitivity analysis in G*Power after data collection. The sensitivity analysis showed that the smallest effect (odds ratio) that could have been detected in a one-tailed logistic regression, with α = .05, power of .8, and a sample size of 104 was 1.88[3].

Materials

Study 1

For Study 1, all questionnaire items were in Dutch.

Study 2

In Study 2, the language used was English.

Packaging Designs

Study 1 — In Study 1, we tested the effect on the self-reported likelihood of recycling a biodegradable biscuit packet and a cup that can be fully recycled.

The non-environmental biscuit packet was an original, unaltered biscuit packet available at Dutch supermarkets at the time of the study (Figure 1). We collaborated with a designer to develop the remaining packaging designs. For the biscuit packages, the designers produced a new design aimed at encouraging individuals to focus on the environment (Figure 1, top right). The environmental biscuit packet used an unbleached carton colour and green as the prominent font colour. At the bottom of the box, a green strip displayed the sentence "This package is fully recyclable". All verbal elements on the packaging were in Dutch.

To develop the cup aimed at encouraging people to focus on the environment (environmental condition), the theory was discussed with the designer who developed designs in two iterative stages. First, the designer developed six environmental designs which were shown to master's students of a course in environmental psychology. These students were asked to choose (anonymously) the cup they would be most likely to recycle. Second, the designer combined the key features of the two designs that the students indicated they were most likely to recycle into several new designs. These

3) According to Chen et al. (2010), an odds ratio of 1.68 is equivalent to Cohen's d = 0.2 (small effect) and an odds ratio of 3.47 is equivalent to a Cohen's d of 0.5 (medium effect).

designs were shown to 15 environmental psychologists working at a Dutch university who discussed the designs and selected the one they believed would be the most likely to make people focus on the environment. Additionally, the designer developed a cup that was not expected to make people focus on the environment (non-environmental condition, N; see Figure 1).

Both cups had six vertical stripes. In the environmental condition (E), every second stripe depicted tree bark, with the unbleached material of the cup visible on the other stripes. The slogan "I'm green and you?" was printed on one of the plain stripes, and another plain stripe included information on the material (100% recyclable, 100% paper) and a recycling logo; all text was printed in green; a colour associated with environmental sustainability (Borgman, 2018) and less likely to be mis-sorted (Nemat et al., 2022). In the non-environmental condition, mathematical formulae were printed in black ink on a white background on half of the stripes. The other stripes were red; a colour associated with a higher likelihood of being mis-sorted (Nemat et al., 2022) and not strongly associated with nature (e.g., Magnier & Crié, 2015). We printed the recycling logo on the non-environmental cup as well, ensuring that information was available to participants in both conditions that the cup could be recycled.

Study 2 — The non-environmental cup varied slightly in Study 2 from the one pictured in Figure 1. Namely, the white background was instead unbleached due to practical issues of printing of the cup material. Further, on one of the red stripes of the non-environmental cup, the logo of the university was printed to make the design more realistic in the university setting. (Note that the university logo is red.)

Recycling Intentions

Study 1 — In Study 1, we asked participants how likely they were to throw the biscuit packet or cup in a glass, paper, plastics, and organic waste bin, respectively, on a 7-point Likert scale (1 = *Very unlikely* to 7 = *Very likely*). We used the likelihood of disposing the item in the paper bin as the dependent variable, as this was the correct bin (Study 1a: M = 6.40, SD = 1.59; Study 1b: M = 6.40, SD = 1.43).

Biospheric Values

Studies 1 and 2 — Biospheric values were measured using the scale reported by Steg, Perlaviciute et al. (2014). Participants rated how important each of four values were as a guiding principle in their lives from -1 (value is opposed to their principles) to 7 (value is of supreme importance), with 0 meaning the value is not at all important. The values were: protecting the environment, respecting the earth, preventing pollution, and unity with nature (Study 1a: α = .87; M = 5.08; SD = 1.47; Study 1b: α = .85; M = 5.03; SD = 1.30; Study 2: α = .94; M = 4.46; SD = 1.93).

Procedure

Study 1

In Study 1, participants were randomly assigned by Qualtrics to one of the four conditions (Study 1a: n_N = 94; n_E = 93; Study 1b: n_N = 96; n_E = 97). Participants gave informed consent and then first filled in the biospheric value questionnaire. (The English version of the biospheric value questionnaire is contained in the basic questionnaire which can be accessed at Sargisson (2025) along with the full questionnaire given to participants in Dutch. Note that the full questionnaire contained additional items. The data for these items are available in the OSF file and a brief analysis of the data is in Appendix A.) They then saw one of the cups on a computer screen and were asked how likely they were to throw the item in a glass, paper, plastics, and organic waste bin.

Study 2

To disguise the true aim of Study 2, we told participants that our aim was to better understand participants' bad habits. The study was named 'Act right, be bright! But always these bad habits'. The study advertisement did not mention the environment. To be eligible for participation in our study, participants had to have completed a basic questionnaire. (The basic questionnaire is available at Sargisson, 2025.) The questionnaire became available 2.5 months prior to our study but participants had to have completed it at minimum 24 hours prior to participating in our study. The basic questionnaire contained the environmental values scale, which participants were asked to respond to twice; once rating the importance of each value as a guiding principle in their own lives, and again for how important each value is to fellow psychology students. Participants also responded to a scale regarding how strongly they identified as students (four items) and how strongly they identified with the university (four items). They also answered a 3-item scale of environmental identity, a 3-item scale of political preference, a 2-item scale of political support, and three demographic questions (gender identity, age, and household composition). We only used data from the environmental values scale in the current study — students could have participated in multiple studies at the university for which the other items were used.

Upon arrival, we told participants that the room was not ready and asked them to wait in the hallway. (The protocol for Study 2 is available at Sargisson, 2025.) As compensation, the experimenter offered participants a free hot or cold beverage in either the environmental or the non-environmental version of the cup. The two conditions randomly varied across two times of the day (morning and afternoon) so that participants did not see the cup of the other condition. Participants arriving in the morning received one of the cup types, and participants in the afternoon received the other cup type, with the type of cup presented in the morning and afternoon varying randomly. Additionally, all cups from the other condition were removed from the room, and the bins, prior to the

experiment starting to ensure that the participant was not complying to the behaviour of previous participants. There were 53 participants assigned to the non-environmental cup and 51 to the environmental cup.

A chair was positioned next to an open pantry where a regular trash bin as well as a recycling bin were situated. From their seats, participants could see both bins (see Figures 2 and 3). The experimenter approached participants after approximately 7 minutes and gave them the consent form. She also indicated that she would be ready to start the study when the participant had finished their drink. Importantly, participants were not explicitly told to recycle their cup, but they were told they were not allowed to bring the cup into the experimental room. To avoid social desirability bias, the experimenter went into another room and waited there for the participant.

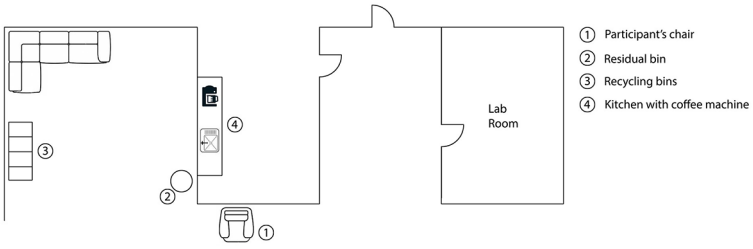
Figure 2

The Setting of Study 2

Notes. a) The hallway, the place where participants waited, and the residual bin close by. b) The setting of the residual bin close by and the recycling bin further away from the perspective of the participant. c) The recycling bin used in this study.

Figure 3

Floorplan of the Setting of Study 2



The paper bin (the correct recycling bin) was in a container comprising a set of four bins (for cans, plastic, paper, and general waste; Figure 2) roughly 5 meters from the right side of the chairs where the participants were asked to wait. On the way to these recycling bins, we placed another small residual bin. It was around the corner on the right side to guarantee that participants would see this when they start looking for a place to discard their cup. Once participants entered the room and completed a questionnaire containing

Table 1

Results of Multiple Regression for Study 1

Product	Predictors	β	*t*(*df*)	95% CI	R^2	R^2_{adj}	*F*(*df*)	*p*
Biscuit	Design	.07	.29(186)	-.39, .53	.02	-.01	.09 (1, 186)	.77
	Values	-.00	-.01(186)	-.16, .16	.02	-.01	.04 (2, 186)	.96
	Design*values	-.01	-.07(186)	-.33, .31	.02	-.02	.03 (3, 186)	.99
Cup	Design	.14	2.01 (191)	.01, .81	.14	.02	4.06 (1, 191)	.045
	Values	.10	1.35 (190)	-.05, .26	.17	.02	2.95 (2, 190)	.06
	Design*values	.65	2.23 (189)	.04, .66	.23	.04	3.66 (3, 189)	.01

sociodemographic items, and some other bogus items (the questionnaire used is available at Sargisson, 2025), the experimenter noted which bin participants had placed their cup. Participants were debriefed after completing the bogus questionnaire. Each participant was informally asked whether they were aware of the purpose of the study, and none were.

Results

Study 1

We first included the design of the biscuit package (Step 1: environmental coded as 1, non-environmental coded as 0), biospheric values (Step 2), and their interaction (Step 3) as predictors of likelihood of recycling in the regression model. The mean recycling scores for all conditions were high (M_E = 6.43, SD_E = 1.57, n = 93; M_N = 6.36, SD_N = 1.62, n = 94). Both environmental designs (biscuit and cup) were perceived to be more sustainable than the non-environmental designs, but only the environmental cup was perceived to be more attractive (Appendix A, Table A.2). Perceived sustainability was a significant predictor of the likelihood of recycling the cup, but not the biscuit package (Appendix A, Table A.3).

Study 1a

The environmental packaging design did not significantly increase intention to recycle the biscuit package compared to the non-environmental design (Table 1), thus **H1** was not supported for the biscuit package. Biospheric values did not enhance the intention to recycle the package, showing a failure to support **H2** (Table 1). In the third step, no significant interaction effect was found for packaging design and biospheric values on recycling (Table 1), showing no support for **H3.**

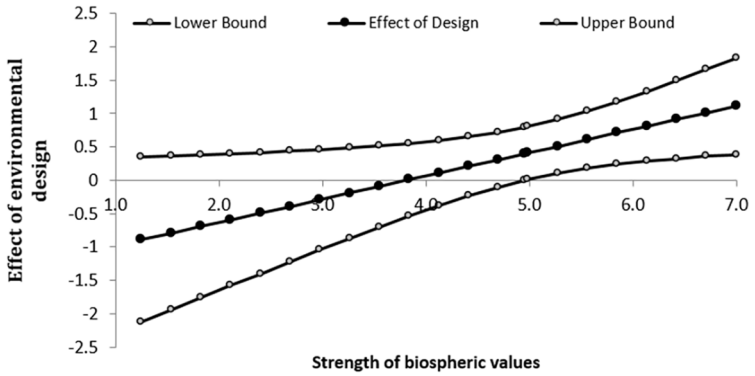
Study 1b

The environmental packaging design (M_E = 6.61, SD_E = 1.00, n = 97) significantly increased intention to recycle the cup compared to the non-environmental design (M_N = 6.20, SD_N = 1.73, n = 96; Table 1), thus **H1** was supported. Biospheric values did not enhance the intention to recycle the cup, showing a failure to support **H2** (Table 1). There was a significant interaction between packaging design and biospheric values on recycling intention (Table 1). However, while an interaction was present, it was not in the expected form, showing only partial support for **H3.**

We used the Johnson-Neyman technique to identify for Study 1b for which levels of biospheric values the packaging design was significantly related to recycling intention. Figure 4 depicts the bandwidth graph with the effect size of packaging design on recycling for different levels of biospheric values using the floodlight technique (Scott & Vigar-Ellis, 2014). This technique assumes that a statistically significant relationship between biospheric values and recycling is present when the 'band' does not encompass zero. The environmental packaging design was positively related to recycling intention when scores on biospheric values were higher than 4.9, while packaging design was not significantly related to intention to recycle the cup when scores on biospheric values were lower than 4.9 (Figure 4), thus when participants endorsed biospheric values rather weakly. This implies that the effect of packaging design on recycling increases as biospheric values increase.

Figure 4

Relationship Between Packaging Design and Likelihood of Recycling for Different Levels of Biospheric Values in Study 1b



Study 2

In Study 2, we tested the effect of packaging design on actual recycling of the cups (1 = *Recycle bin*; 0 = *Regular bin*). A two-step logistic regression showed that the model in

Step 1, including the main effects of packaging design and biospheric values, was significant (Table 2). As expected, the cup with the environmental design was recycled significantly more often (Table 2), supporting **H1**, by 58.8% of the participants, whereas the cup with the non-environmental design was only recycled by 28.3% of the participants. (Note that we combined counts for cups discarded into any bin other than the paper recycling bin. The counts for both types of cup and every available disposal method are in Table A.4 in Appendix B.) We did not find a significant main effect of biospheric values on recycling behaviour, therefore failing to find support for **H2** (Table 2). The regression model of Step 2 revealed a significant interaction between packaging design and biospheric values (Table 2). The interaction, again, showed only partial support for **H3** because, while it was present, it was not in the expected form. Note that we did not conduct power analyses for the interaction effect, nor did we correct the significance level to account for multiple testing, and, with a p value of .04, the statistical significance of the interaction effect should be treated with caution.

Table 2

Results of Stepwise Logistic Regression for Study 2

Step	Predictors	b	Wald χ^2 (1)	p	$R^2_{\text{Nagelkerke}}$	χ^2	p
Step 1	Design	-1.29	9.5	.002	.14	11.19	.004
	Values	.12	1.15	.29			
Step 2	Design*values	.46	4.2	.04	.19	15.48	.001

Note. The degrees of freedom for χ^2 was 2 for Step 1 and 3 for Step 2.

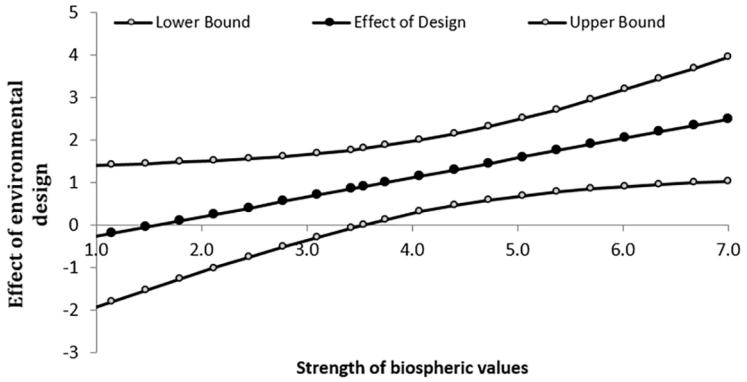
The Johnson-Neyman technique (Hayes, 2013; 2016) (see Figure 5) revealed that the effect of packaging design on recycling was more pronounced when scores on biospheric values were higher than 3.6, while packaging design was not significantly related to the likelihood that the cup would be recycled when scores were lower than 3.6. Hence, Study 2 replicated the results of Study 1 in a naturalistic setting and for actual recycling behaviour: The packaging intended to make people focus on the environment was recycled more than the packaging of the non-environmental condition, with this effect strengthening with increasing biospheric values.

Discussion

Our results suggest that packaging design can encourage pro-environmental behaviour, in our case recycling, when it makes people focus more on the environment, particularly when people increasingly endorse biospheric values. Specifically, although there was no effect of design on the intention to recycle the biscuit package, we found a significant

Figure 5

The Relationship Between Packaging Design and Recycling Behaviour for Different Levels of Biospheric Values in Study 2



effect of the environmental design on both reported intentions to recycle and actual recycling of the newly designed cup.

One factor that may have led to increased recycling of the cup in the environmental condition could have been the multiple cues used in the design. Specifically, the cups were different colours, displayed environmentally relevant or irrelevant images, and the environmental cup featured more prominent labelling indicating that the cup was recyclable. Labels, logos, and packaging materials are the most important features used by consumers to identify environmentally friendly packaging (Ketelsen et al., 2020), but consumers also use other cues, such as images on the packaging, or the colour of the packaging, with cream, brown, and green being most associated with environmental friendliness (Scott & Vigar-Ellis, 2014). The design of the two cups was very different, with the environmental design using both colour, images, and prominent eco-friendly labelling. Thus, it may be that the designs used on the two cups were highly discriminable, leading to greater recycling of the environmental cup. Future researchers could systematically vary different features of the designs to determine which elements are most effective in encouraging recycling and whether combining influential features of designs might further increase their effectiveness.

The biscuit package was from a long-standing, well-known brand in the Dutch market. It may be that participants had already formed opinions about the brand and ways to dispose of the package. Participants reported that they would recycle the biscuit packages at high rates — even for the non-environmental design — producing a ceiling effect whereby it was not possible to further increase recycling rates for the environmental designs. As the cup was not related to a certain product or brand, it may

be that there were no confounding, pre-existing effects of the product or brand and therefore the environmental packaging design was successful in making people focus on the environment. Additionally, it may be that takeout cups are less commonly recycled as they cannot always be placed in the paper recycling bin, whereas cardboard biscuit packages can always be recycled and may already be disposed of that way. Indeed, perceived sustainability was a significant predictor of the likelihood of recycling the cup but not of the biscuit package (Appendix A, Table A.3). More research is needed to examine the product-brand-packaging relationship, and common ways of disposing of such product packaging, when aiming at making people focus on the environment. Researchers could investigate which strategies are most successful in allowing existing, and novel products, brands, or packages to be perceived as environmentally friendly by consumers.

Unexpectedly, biospheric values were not directly related to the intention to recycle, or actual recycling behaviour. While this non-significant finding contrasts those usually found (Geiger et al., 2019; Steg, 2016; van der Werff et al., 2013), it is consistent with findings from a study that included contextual variables as predictors of behaviour (Linder et al., 2021). For example, biospheric values did not predict whether participants recycled a plastic yoghurt cup (Linder et al., 2021), rather, recycling behaviour was exclusively predicted by contextual factors (in this case, the location of the bins). Similarly, we found that design (a contextual factor) was a significant predictor of actual recycling. Although we did not find a main effect of biospheric values on recycling intentions or behaviour, we did find an interaction for the cup design: The effect of the packaging design of the cup on recycling became more pronounced as biospheric values increased. Therefore, biospheric values may moderate the effect of design in that only people who hold moderately strong to strong biospheric values are sensitive to the effects of design.

In sum, our results for the cup design support the IFEP model (Steg, Bolderdijk et al., 2014), suggesting that contextual factors, including design, can promote pro-environmental behaviours, including recycling. The interaction effect of packaging design and biospheric values on recycling of the cup did not fully support the ABC model. The ABC model would predict that people who hold weak biospheric values are less likely to be affected by the package design, which aligns with our findings. However, rather than design having the greatest effect on those with moderate biospheric values, we found that the relationship between recycling and design became stronger as biospheric values strengthened (Figures 4 and 5). As we did not conduct power analyses specifically for the interaction effect, caution should be taken in interpreting our interaction results. However, the trends in Figures 4 and 5 do seem to support the existence and replicability of the interaction in both studies. A possible explanation for our interaction effect may be that as takeout cups cannot be consistently recycled, even individuals with strong biospheric values may need a reminder to recycle. Similar findings were recently reported: In the absence of reminders, none of the study's participants turned off their

computer screens, irrespective of their environmental attitudes (Moussaoui et al., 2020). Schultz (2014) argues that people often do not engage in pro-environmental behaviour because they forget to, and a reminder can facilitate the behaviour, particularly if the individual is already motivated to behave. Future research could further investigate under which conditions, and for which levels of biospheric values, the interaction effect of packaging design and biospheric is more pronounced. Some researchers have found an interaction between motivational and contextual factors on pro-environmental behaviour (e.g., Bolderdijk et al., 2013; Sauer & Rüttinger, 2004; van den Broek et al., 2017; Wiese et al., 2004), while others have not (e.g., Moussaoui et al., 2020). More research on the existence and nature of an interaction is important to understand how to make best use of contextual cues and informational messages to encourage the pro-environmental behaviour of people who prioritise different values.

We acknowledge that while the sample for Study 1 was a representative sample, the samples for both studies came from the Netherlands, which is a western, educated, industrialized, rich, and democratic (WEIRD) country, and, as such, our results may not generalize to non-WEIRD populations. Our sample for Study 2 was also not widely representative, being first-year psychology students. We recommend replication of our studies with more diverse populations to ensure that the results generalise. Additionally, we acknowledge as a limitation that the studies were not pre-registered. However, the fact that the results of Study 1 were replicated in Study 2 with actual behaviour provides confidence in the findings. We note that a key difference between Studies 1 and 2 was that there was no general waste bin offered in Study 1 while there was in Study 2. Although we found similar results in both studies, it may be that the presence of a potentially more convenient general waste bin in Study 2 lowered recycling rates in that study compared to Study 1. Future researchers should ensure comparable conditions to allow better comparison between intended and actual recycling rates.

Our results have important practical implications: A small cue such as packaging design can lead to more recycling, particularly for those with strong biospheric values. We used packaging design to examine whether a contextual factor that makes people focus on the environment can promote recycling behaviour. Practitioners may also consider the context more generally and re-design, for example, recycling bins, in a way that makes people focus on the environment to promote recycling. Future research could investigate which features of packaging design have the greatest influence on recycling rates by systematically varying features of the design. Additionally, future researchers could integrate other theories on behavioural change in the design and test effects of environmental designs on different pro-environmental behaviours. Based on such research, design principles can be derived that can be used to promote pro-environmental behaviour change.

Conclusion

Our study extends previous research on design for behavioural change. Notably, in addition to research that reports that packaging design influences purchase likelihood (Magnier et al., 2016 Pancer et al., 2017; Steenis et al., 2017), our results suggest that packaging design can be related to recycling behaviour, which is critical to reducing the ultimate environmental impact of packaging. Furthermore, our results reveal how and under which conditions design can stimulate recycling by developing theory-based designs. Specifically, a packaging design that makes people focus on the environment can promote recycling behaviour, particularly among people who hold moderately strong to strong biospheric values. A particular strength of our study is that we measured actual behaviour in addition to self-reported behavioural intentions.

Openness and Transparency Statements

The present article has been checked by its handling editor(s) for compliance with the journal's open science and transparency policies. The completed *Transparency Checklist* is publicly available at:
http://doi.org/10.23668/psycharchives.16858

Author Contributions.

Josefine L. Geiger: Conceptualization. Methodology. Formal analysis. Investigation. Data curation. Writing – original draft.

Rebecca J. Sargisson: Validation. Formal analysis. Data curation. Writing – review & editing. Visualization.

A. Berfu Ünal: Conceptualization. Methodology. Writing – review & editing. Supervision.

Ellen Van der Werff: Conceptualization. Methodology. Writing – review & editing. Supervision.

Linda Steg: Conceptualization. Methodology. Writing – review & editing. Supervision. Project administration. Funding acquisition.

Acknowledgments. The content of the paper reflects only the views of the authors. We want to thank Nicole Sauer for designing the cups. We want to thank Lotta Holsten and Maria Velichkova for their support in the data collection of Study 2.

The studies reported in this article formed part of the PhD thesis of Josefine Geiger and therefore some content may overlap.

Funding. This research was funded by the Top Institute Food and Nutrition (TIFN), a public-private partnership on pre-competitive research in food and nutrition, and the Dutch Knowledge Institute for Sustainable Packaging (KIDV) under Grant SD002 Sustainable Packages. The study design, data collection and analysis, as well as the manuscript writing were the sole responsibility of the academic partners.

Competing Interests. The authors declare no competing interests.

Ethics Statement. Prior to data collection, the Ethics Committee of Psychology (ECP) of the University of Groningen approved the research (16221-S-N and 17107-S-NE). Informed consent was obtained from all participants prior to commencement of each study, and all studies adhered to current European Union ethical guidelines for research with human participants.

Diversity Statement. In the list below, the check mark (☑) indicates which steps were taken to increase diversity within the context of this paper. Steps that were not taken or did not apply are unmarked (☐).

- ☑ Ethnically or otherwise diverse sample(s)
- ☑ Gender balanced sample(s)
- ☑ Inclusive gender measure
- ☑ Inclusive materials
- ☑ Sampling justification
- ☐ Extensive sample description
- ☑ Discussion of generalizability
- ☑ Diverse reference list
- ☑ Underprivileged / minority author(s)
- ☑ Early career author(s)
- ☑ Degree of privilege/marginalization considered in authorship order
- ☐ Author(s) from sampled population (avoiding 'helicopter science')

Data Availability. All data and supplementary materials are available at (Sargisson, 2025)

Supplementary Materials. The following table provides an overview of the accessibility of supplementary materials (if any) for this paper.

Type of supplementary material	Availability/Access
Data	
Datafiles for Study 1 and Study 2.	Sargisson (2025)
Code	
SPSS syntax for Study 1 and Study 2.	Sargisson (2025)
Material	
a) Basic questionnaire.	Sargisson (2025)
b) Questionnaire Study 1.	Sargisson (2025)
c) Questionnaire Study 2.	Sargisson (2025)
d) Protocol Study 2.	Sargisson (2025)

Badges for Good Research Practices.

Open data: YES.
Open code: YES.
Open materials: YES.
Preregistration: NO.
Diversity statement: YES.

Note: YES = the present article meets the criteria for awarding the badge. NO = the present article does not meet the criteria for awarding the badge *or* the criteria are not applicable.

References

Buelow, S., Lewis, H., & Sonneveld, K. (2010). The role of labels in directing consumer packaging waste. *Management of Environmental Quality, 21*(2), 198–213. https://doi.org/10.1108/14777831011025544

Bolderdijk, J. W., Gorsira, M., Keizer, K., & Steg, L. (2013). Values determine the (in)effectiveness of informational interventions in promoting pro-environmental behavior. *PLoS One, 8*(12), Article e83911. https://doi.org/10.1371/journal.pone.0083911

Borgman, I. (2018). *The influence of packaging design features on consumers' purchasing and recycling behaviour* [Unpublished Master thesis]. University of Twente. http://essay.utwente.nl/75904/1/Borgman_MA_ET.pdf

Chen, H., Cohen, P., & Chen, S. (2010). How big is a big odds ratio? Interpreting the magnitudes of odds ratios in epidemiological studies. *Communications in Statistics — Simulation and Computation, 39*(4), 860–864. https://doi.org/10.1080/03610911003650383

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Eurostat. (2024). *Packaging waste statistics*. Eurostat. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Packaging_waste_statistics

Feather, N. T. (1995). Values, valences, and choice: The influences of values on the perceived attractiveness and choice of alternatives. *Journal of Personality and Social Psychology, 68*(6), 1135–1151. https://doi.org/10.1037/0022-3514.68.6.1135

Geiger, J. L., Steg, L., van der Werff, E., & Ünal, A. B. (2019). A meta-analysis of factors related to recycling. *Journal of Environmental Psychology, 64*, 78–97. https://doi.org/10.1016/j.jenvp.2019.05.004

Guagnano, G. A., Stern, P. C., & Dietz, T. (1995). Influences on attitude-behavior relationships. A natural experiment with curbside recycling. *Environment and Behavior, 27*(5), 699–718. https://doi.org/10.1177/0013916595275005

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.

Hayes, A. F. (2016). *PROCESS* (Version 2.16) [Add-on for SPSS and SAS]. http://processmacro.org/

Hoek, J. (2019). *Towards waste management in a circular economy: Policy effects on waste flows in the municipality of Utrecht* [Master's thesis]. Utrecht University Student Theses Repository. https://studenttheses.uu.nl/bitstream/handle/20.500.12932/32850/MasterThesis_Final_JFSHoek.pdf?sequence=2

Keizer, M., Sargisson, R. J., Van Zomeren, M., & Steg, L. (2019). When personal norms predict the acceptability of push and pull car-reduction policies: Testing the ABC model and low-cost hypothesis. *Transportation Research Part F: Traffic Psychology and Behaviour, 64*, 413–423. https://doi.org/10.1016/j.trf.2019.06.005

Ketelsen, M., Janssen, M., & Hamm, U. (2020). Consumers' response to environmentally-friendly food packaging — A systematic review. *Journal of Cleaner Production, 254*(1), Article 120123. https://doi.org/10.1016/j.jclepro.2020.120123

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling, 127*, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Langley, J., Turner, N., & Yoxall, A. (2011). Attributes of packaging and influences on waste. *Packaging Technology & Science, 24*(3), 161–175. https://doi.org/10.1002/pts.924

Lehmann, L. V. (2015). The garbage project revisited: From a 20th century archaeology of food waste to a contemporary study of food packaging waste. *Sustainability, 7*(6), 6994–7010. https://doi.org/10.3390/su7066994

Linder, N., Rosenthal, S., Sörqvist, P., & Barthel, S. (2021). Internal and external factors' influence on recycling: Insights from a laboratory experiment with observed behavior. *Frontiers in Psychology, 12*, Article 699410. https://doi.org/10.3389/fpsyg.2021.699410

Magnier, L., & Crié, D. (2015). Communicating packaging eco-friendliness: An exploration of consumers' perceptions of eco-designed packaging. *International Journal of Retail & Distribution Management, 43*(4/5), 350–366. https://doi.org/10.1108/IJRDM-04-2014-0048

Magnier, L., Schoormans, J., & Mugge, R. (2016). Judging a product by its cover: Packaging sustainability and perceptions of quality in food products. *Food Quality and Preference, 53*, 132–142. https://doi.org/10.1016/j.foodqual.2016.06.006

Martinho, G., Pires, A., Portela, G., & Fonseca, M. (2015). Factors affecting consumers' choices concerning sustainable packaging during product purchase and recycling. *Resources, Conservation and Recycling, 103*, 58–68. https://doi.org/10.1016/j.resconrec.2015.07.012

Moussaoui, L. S., Desrichard, O., & Milfont, T. L. (2020). Do environmental prompts work the same for everyone? A test of environmental attitudes as a moderator. *Frontiers in Psychology, 10*, Article 3057. https://doi.org/10.3389/fpsyg.2019.03057

Nemat, B., Razzaghi, M., Bolton, K., & Rousta, K. (2022). Design affordance of plastic food packaging for consumer sorting behavior. *Resources, Conservation and Recycling, 177*, Article 105949. https://doi.org/10.1016/j.resconrec.2021.105949

Orzan, G., Cruceru, A. F., Bălăceanu, C. T., & Chivu, R.-G. (2018). Consumers' behavior concerning sustainable packaging: An exploratory study on Romanian consumers. *Sustainability, 10*(6), Article 1787. https://doi.org/10.3390/su10061787

Pancer, E., McShane, L., & Noseworthy, T. J. (2017). Isolated environmental cues and product efficacy penalties: The color green and eco-labels. *Journal of Business Ethics, 143*, 159–177. https://doi.org/10.1007/s10551-015-2764-4

Peeters, A. L., Van der Werff, E., & Tromp, N. (2022). Designing for value-behaviour consistency: Ethical choice architecture to stimulate sustainable meat purchase. *Cleaner and Responsible Consumption, 5*, Article 100067. https://doi.org/10.1016/j.clrc.2022.100067

Perlaviciute, G., & Steg, L. (2015). The influence of values on evaluations of energy alternatives. *Renewable Energy, 77*, 259–267. https://doi.org/10.1016/j.renene.2014.12.020

Qualtrics. (2025). *Experience management software*. Qualtrics[XM]. https://www.qualtrics.com

Ruepert, A. M., Keizer, K., & Steg, L. (2017). The relationship between Corporate Environmental Responsibility, employees' biospheric values and pro-environmental behaviour at work. *Journal of Environmental Psychology, 54*, 65–78. https://doi.org/10.1016/j.jenvp.2017.10.006

Sargisson, R. (2025). *Design for behaviour change — The influence of packaging design on recycling* [Questionnaires for Studies 1 and 2, Study 2 protocol, SPSS syntax for Studies 1 and 2, data for Studies 1 and 2]. OSF. https://osf.io/23kjg/

Sauer, J., & Rüttinger, B. (2004). Environmental conservation in the domestic domain: The influence of technical design features and person-based factors. *Ergonomics, 47*(10), 1053–1072. https://doi.org/10.1080/00140130410001686302

Schultz, P. W. (2014). Strategies for promoting proenvironmental behaviour: Lots of tools but few instructions. *European Psychologist, 19*(2), 107–117. https://doi.org/10.1027/1016-9040/a000163

Scott, L., & Vigar-Ellis, D. (2014). Consumer understanding, perceptions and behaviours with regard to environmentally friendly packaging in a developing nation. *International Journal of Consumer Studies, 38*(6), 642–649. https://doi.org/10.1111/ijcs.12136

Steenis, N. D., van Herpen, E., van der Lans, I. A., Ligthart, T. N., & van Trijp, H. C. (2017). Consumer response to packaging design: The role of packaging materials and graphics in sustainability perceptions and product evaluations. *Journal of Cleaner Production, 162*, 286–298. https://doi.org/10.1016/j.jclepro.2017.06.036

Steg, L. (2016). Values, norms, and intrinsic motivation to act proenvironmentally. *Annual Review of Environment and Resources, 41*, 277–292. https://doi.org/10.1146/annurev-environ-110615-085947

Steg, L., Bolderdijk, J. W., Keizer, K., & Perlaviciute, G. (2014). An integrated framework for encouraging pro-environmental behaviour: The role of values, situational factors and goals. *Journal of Environmental Psychology, 38*, 104–115. https://doi.org/10.1016/j.jenvp.2014.01.002

Steg, L., & de Groot, J. I. (2012). Environmental values. In S. D. Clayton (Ed.), *Oxford handbook of environmental and conservation psychology* (pp. 81–92). https://doi.org/10.1093/oxfordhb/9780199733026.013.0005

Steg, L., Perlaviciute, G., Van der Werff, E., & Lurvink, J. (2014). The significance of hedonic values for environmentally relevant attitudes, preferences, and actions. *Environment and Behavior, 46*(2), 163–192. https://doi.org/10.1177/0013916512454730

Stern, P. C., & Oskamp, S. (1987). Managing scarce environmental resources. In D. Stokols & I. Altman (Eds.), *Handbook of environmental psychology* (pp. 1044–1088). Wiley.

Tromp, N., & Hekkert, P. (2016). Assessing methods for effect-driven design: Evaluation of a social design method. *Design Studies, 43*, 24–47. https://doi.org/10.1016/j.destud.2015.12.002

Tromp, N., Hekkert, P., & Verbeek, P. P. (2011). Design for socially responsible behavior: A classification of influence based on intended user experience. *Design Issues, 27*(3), 3–19. https://doi.org/10.1162/DESI_a_00087

van den Broek, K., Bolderdijk, J. W., & Steg, L. (2017). Individual differences in values determine the relative persuasiveness of biospheric, economic and combined appeals. *Journal of Environmental Psychology, 53*, 145–156. https://doi.org/10.1016/j.jenvp.2017.07.009

van der Werff, E., Steg, L., & Keizer, K. (2013). The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour. *Journal of Environmental Psychology, 34*, 55–63. https://doi.org/10.1016/j.jenvp.2012.12.006

Verplanken, B., & Holland, R. W. (2002). Motivated decision making: Effects of activation and self-centrality of values on choices and behavior. *Journal of Personality and Social Psychology, 82*(3), 434–447. https://doi.org/10.1037/0022-3514.82.3.434

Wikström, F., Williams, H., Verghese, K., & Clune, S. (2014). The influence of packaging attributes on consumer behaviour in food-packaging life cycle assessment studies — A neglected topic. *Journal of Cleaner Production, 73*, 100–108. https://doi.org/10.1016/j.jclepro.2013.10.042

Wiese, B., Sauer, J., & Rüttinger, B. (2004). Consumers' use of written product information. *Ergonomics, 47*(11), 1180–1194. https://doi.org/10.1080/00140130410001695951

Appendices

Appendix A

Measurement of the Dependent Variable — Likelihood of Recycling

To measure the likelihood of recycling, we asked two questions:

1. [For cups] Imagine that you bought a cup of coffee or tea in this cup at the station. You have finished the drink and are about to throw the cup away [For biscuit package] Imagine that you bought this product and are eating the last cookie at home. [For both] You are going to throw away the packaging. How likely are you to throw the packaging in one of the waste bins below: (1 = *Definitely not*; 7 = *Definitely*)?
   a. Glass.
   b. Paper and cardboard.
   c. Plastic and synthetic packaging.
   d. Biodegradable waste.
2. In which waste bin would you throw this packaging?
   a. Paper bin.
   b. General recycling bin.
   c. Food bin.

For analysis, we used the response to Question 1b above as the dependent variable as this was the correct way to dispose of the packages. The responses to the other options in Question 1 and to Question 2 were judged to be not useful for data analysis as it is not clear which of these options would signal correct recycling of the packages.

Purchase Likelihood and Product Suitability

We asked participants "Would you like to buy coffee or tea in this cup?" or "Would you like to buy this product?" We also asked "How suitable do you think this cup is for coffee or tea to-go?" or "How suitable do you think this packaging is for the product?"

For the cups, participants were significantly more likely to indicate that they would buy the environmental cup compared to the non-environmental cup and that the environmental cup was more suitable for coffee or tea than the non-environmental cup (Table A.1). For the biscuit packages, there was no difference in purchase likelihood or product suitability between the two designs (Table A.1).

Table A.1

Purchase Likelihood and Suitability of the Cup and Biscuit Designs

Product	Question	Design	*M*	*SD*	*N*	*t*	*p*
Cups	Purchase	Environmental	4.04	1.10	189	-3.20	.002
		Non-Environmental	3.47	1.34			
	Suitability	Environmental	4.01	1.08	189	-2.71	.007
		Non-Environmental	3.55	1.28			
Biscuit	Purchase	Environmental	2.54	1.46	182	-1.10	.27
		Non-Environmental	2.32	1.36			
	Suitability	Environmental	3.60	1.28	182	-1.64	.10
		Non-Environmental	3.29	1.25			

Perceived Sustainability and Attractiveness

Mean scale scores were calculated for perceived sustainability and perceived attractiveness of the two cup and biscuit packet designs.

a. Perceived sustainability items:
   - This packaging is environmentally friendly/Deze verpakking is milieuvriendelijk.
   - This packaging has a relatively low environmental impact/Deze verpakking heft een relatief lage milieu-impact.
   - This packaging is good for the environment/Deze verpakking is goed voor het milieu.

b. Perceived attractiveness items:
   - This packaging is attractive/ Deze verpakking is aantrekkelijk.
   - This packaging is beautiful/Deze verpakking is mooi.

For the cups, the environmental packaging design was perceived to be more sustainable and more attractive than the non-environmental design (Table A.2). For the biscuit packages, the environmental design was perceived to be more sustainable, but not more attractive than the non-environmental design (Table A.2).

Table A.2

Perceived Sustainability and Attractiveness of the Cup and Biscuit Designs

Product	Question	Design	*M*	*SD*	*N*	*t*	*p*
Cups	Sustainability	Environmental	4.85	1.06	187	-6.04	< .001
		Non-Environmental	3.71	1.52			
	Attractiveness	Environmental	4.86	1.35	187	-5.47	< .001
		Non-Environmental	3.70	1.55			
Biscuit	Sustainability	Environmental	4.31	1.40	174	-3.78	< .001
		Non-Environmental	3.49	1.29			
	Attractiveness	Environmental	4.40	1.45	174	-.85	.20
		Non-Environmental	4.21	1.48			

For the cups, perceived sustainability was a positive predictor of the likelihood of recycling, but perceived attractiveness did not predict likelihood of recycling. For the biscuit packages, neither perceived sustainability and nor attractiveness of the designs predicted the likelihood of recycling the packaging (Table A.3).

Table A.3

Predicting Likelihood of Recycling Cup and Biscuit Designs from Perceived Sustainability and Attractiveness

					95% CI	
Product	Predictor	β	*t*	*p*	Lower	Upper
Cups	(Constant)		15.57	< .001	4.75	6.13
	Sustainability	.18	2.08	.04	.009	.36
	Attractiveness	.04	.46	.65	-.12	.20
Biscuit	(Constant)		15.44	< .001	5.30	6.85
	Sustainability	.05	.57	.57	-.13	.23
	Attractiveness	.04	.43	.67	-.14	.22

Note. Model fit Cups: R = .21, adj. R^2 = .03, $F(2, 186)$ = 4.33, p = .02; Model fit: Biscuit: R = .07, adj. R^2 = -.01, $F(2, 173)$ = .48, p = .62.

Influence of the Packaging on the Environment

In a set of questions, we asked participants to "indicate what you think is the influence of this packaging".

Item 1: This packaging leads to less/more depletion of raw materials.
Item 2: This packaging leads to less/more waste problems in the oceans.
Item 3: This packaging leads to less/more environmental pollution.
Item 4: This packaging leads to less/more climate change due to greenhouse gas emissions.
Item 5: This packaging has a negative/positive impact on the environment.

Values for Item 5 were reverse coded prior to analysis.

Scores on each item were averaged to produce a mean score reflecting the perception of the influence of the packages on the environment.

For the biscuit packages, the environmental package was perceived to have a lower negative effect on the environment (M = 3.44, SD = 1.37) than the non-environmental, M = 4.01, SD = 1.04, $t(161) = 3.07$, $p = .002$.

For the cups, the environmental package was perceived to have a lower negative effect on the environment (M = 3.48, SD = 0.98) than the non-environmental, M = 4.02, SD = 1.12, $t(187) = 354$, $p < .001$.

Difficulty of Recycling

In two questions, we asked participants how difficult it was for them to recycle the packaging. The responses to the two items were averaged with smaller numbers indicating that it was very easy to recycle and larger numbers that it was very difficult.

For the cups, we told the participants to imagine that they had purchased a cup of tea or coffee at the station. We asked: "How easy is it for you to recycle this cup at the station?" and "How much effort does it take for you to recycle this cup at the station?" There was no significant difference between how easy the participants rated recycling the environmental (M = 3.77, SD = 1.96) versus the non-environmental, M = 3.94, SD = 2.05, $t(181) = 0.57$, $p = .57$, cup.

For the biscuit packages, we told the participants to imagine that they had purchased the product and were eating the last cookie at home. We asked: "How easy is it for you to recycle this packaging at your home?" and "How much effort does it take for you to recycle this packaging at your home?" There was no significant difference between how easy the participants rated recycling the environmental (M = 2.17, SD = 2.02) versus the non-environmental, M = 2.28, SD = 1.87, $t(169) = 0.39$, $p = .70$, packet.

Appendix B

Table A.4

Counts of the Number of Environmental and Non-Environmental Cups Disposed of by Each Method

Condition	Cans	Plastic	Paper	General	Residual	Left on Table/Floor	Totals
N	0	0	15	4	27	7	53
E	1	2	30	0	14	4	51
Totals	1	2	45	4	41	11	104

Note. N = Non-Environmental, E = Environmental. Any cups placed in the paper bin were counted as having been recycled. Counts for all other disposal methods were summed and cups disposed of by these methods were considered to not have been recycled.