



Effects of abstract and concrete communication on moral signalling and purchase intention of upcycled food products

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ABSTRACT

Increasing consumer adoption of upcycled food products contributes to making the food system more resource efficient and to transitioning towards a circular economy. Yet, it is unclear how upcycled food can best be communicated towards consumers so that it signals something positive about consumers and make consumers more inclined to purchase upcycled food. In the current study, we examine to what extent upcycled foods may evoke morally self-rewarding feelings associated with purchasing upcycled food for consumers depending on (1) whether environmental or health product benefits are communicated in (2) either an abstract (generic sustainability or health lifestyle benefits) or concrete fashion (specific environmental or nutritional benefits). We found that concrete product communication led to stronger anticipated self-rewarding feelings associated with purchasing upcycled food, relative to abstract communication of either environmental or health benefits. Regardless of level of abstraction, communicating environmental (rather than health) benefits also led to stronger self-rewarding feelings. In turn, the stronger anticipated self-rewarding feelings were, the higher consumers' intention to purchase upcycled food. The findings provide marketing guidelines for companies on upcycled food: product communication about concrete environmental or nutritional benefits of upcycled food increases the extent to which consumers experience purchasing upcycled food as morally self-rewarding, which in turn is positively associated with consumers' intention to purchase upcycled food.

1. Introduction

In recent years, we are increasingly confronted with global challenges such as climate change which has fuelled the necessity to make the food system more sustainable (e.g., Herrero et al., 2020) and accelerated the transition towards a circular economy (e.g., Geissdoerfer et al., 2017). Using resources more efficiently to produce food for consumers is in line with tackling these challenges. When otherwise wasted resources are used as ingredients for food production, the concept of a circular economy is applied to making the food system more sustainable (Jurgilevich et al., 2016). Preventing waste has been identified as key in transitioning towards a more sustainable food system (Ciccullo et al., 2021; Herrero et al., 2020), especially given estimates that one-third of all food produced is being wasted (Gustavsson et al., 2011) and its consequences for food security (Irani et al., 2018).

Upcycling involves creating product value from resources which would otherwise be wasted (Bridgens et al., 2018). In the food context, we define upcycled food products as materials that otherwise would be

disposed of or wasted and are brought back into the food system (Aschemann-Witzel and Stangherlin, 2021). These upcycled elements typically are side streams or by-products of food production which are re-applied in producing novel food products (Bhatt et al., 2020; Galanakis, 2012; Peschel and Aschemann-Witzel, 2020). Such side streams or by-products can also be used as feed, but more value is created when they are upcycled for novel food production (Roth et al., 2019). In recent years, availability of upcycled foods to consumers has gradually increased; a positive consumer response to upcycled food is critical to capitalize on this traction (Goodman-Smith et al., 2021). Consumer research on upcycled food is scarce (Aschemann-Witzel and Stangherlin, 2021; Grasso et al., 2023), but initial indications look promising: a small majority of consumers are open to purchasing upcycled food (Coderoni and Perito, 2020) and consumers have been found to sometimes prefer upcycled food over food items without upcycled ingredients, when it concerns vice (but not virtue) products (Peschel and Aschemann-Witzel, 2020). Note that consumers were more interested in buying upcycled products when they had higher expectations of quality and taste of these

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products (Yilmaz and Kahveci, 2022). Still, the concept of using upcycled ingredients for food production is largely unfamiliar to consumers (Grasso et al., 2020). Consumers' willingness to pay for upcycled food tends to be lower than for comparable alternatives without upcycled ingredients (Bhatt et al., 2020), though providing information on nutritional or environmental benefits increases consumers' willingness to pay for upcycled foods (Asioli and Grasso, 2021). Furthermore, consumers generally have a negative association with waste (Abbey et al., 2015), also concerning upcycled foods (de Visser-Amundson et al., 2021), thus explicitly communicating about circular product benefits of upcycled food (i.e., communicating about the used by-product ingredients and prevention of waste) might not necessarily facilitate consumer acceptance.

The question remains how practitioners can effectively communicate about upcycled food products to boost consumers' purchase intention: which product benefits of upcycled food can best be communicated to stimulate consumer acceptance, and what is the underlying mechanism? In attempting to answer this question we explore to what extent communication of environmental (i.e., circular) product benefits of upcycled food has added value for consumers, relative to communicating other types of benefits that upcycled food might have. Aschemann-Witzel and Stangherlin (2021) conclude that research on the consumer uptake of upcycled food products is still scarce. To our knowledge, a study from Aschemann-Witzel et al. (2022) was the first to explore potentially effective ways to communicate about upcycled food: their findings indicated that stressing upcycled food benefits in terms of frugality or climate led to a more positive attitude towards upcycled food than stressing the products' taste.

In the current study, we further explore potentially effective communication strategies for upcycled food by building on moral signalling theory to examine (1) whether various forms of product communication of upcycled food lead to morally self-rewarding feelings, and (2) to what extent these moral signalling consequences of product communication in turn affect consumers' purchase intention. More specifically, we propose that upcycled food products have various degrees of moral signalling consequences for consumers, depending on which type of product benefits are communicated to consumers, as well as the level of abstraction of this communication. We test this empirically for two upcycled food product cases (i.e., bean-based and insect-based upcycled food products) in a 2 (communicated product benefits: environmental versus health) x 2 (level of abstraction of communicated messages: concrete versus abstract) between-subjects design. By doing so, our study not only contributes to the relatively recent stream of consumer studies on upcycled food, but it also provides practical implications for companies on how to communicate about their upcycled food products.

2. Literature review and hypothesis formulation

2.1. Moral signalling: morally self-rewarding feelings

The type of product information that is communicated towards consumers allow them to make certain inferences about a product; consequently, purchasing the product can signal something to themselves (Boulding and Kirmani, 1993). For instance, consumers can infer a sense of social status when products are more expensive because purchasing higher-priced products signals that one is wealthy (Bagwell and Bernheim, 1996). Consumption of sustainable products in general has been shown to signal various personality traits, such as one's sense of morality (Mazar and Zhong, 2010) and innovativeness (Noppers et al., 2014). Signalling theory posits that a signal is particularly effective in the context of consumer behaviour when the behaviour is in some way costly (Noppers et al., 2014). For example, research on green products shows that price premiums serve as costly signals to convey one's altruism and ability to incur costs for a higher cause (Griskevicius et al., 2010). Studies have shown that particularly novel sustainable (food)

products can be perceived as costly by consumers because of perceived instrumental drawbacks (Hunt et al., 2013; Noppers et al., 2014; Taufik et al., 2022), suggesting that purchasing novel sustainable products such as upcycled foods have potentially even stronger signalling consequences.

Positive moral attitude concerns the extent to which consumers positively evaluate themselves by behaving in accordance with their moral principles (Arvola et al., 2008); this is reflected in the experience of morally self-rewarding feelings (Arvola et al., 2008). Self-rewarding feelings have been found relevant in the domain of sustainable food, with consumers associating the purchase of organic food (Arvola et al., 2008; Dowd and Burke, 2013), and circular foods containing by-products (Altintzoglou et al., 2021) with experiencing morally self-rewarding feelings.

2.2. Communication of environmental and health benefits

Promoting upcycled food products in a way that positively affects these products' moral signalling consequences may potentially boost consumers' intention to purchase upcycled foods. A first step is to examine the signalling consequences of the type of product benefit that is communicated to consumers. Coderoni and Perito (2020) show that consumers' willingness to purchase upcycled food is partly based on their beliefs regarding environmental and health benefits of upcycled food. There are initial indications that communicating environmental (rather than health) benefits of upcycled food is more effective: consumers view other-interested benefits as more important drivers for their decision to purchase upcycled food than more self-interested benefits such as health benefits (Bhatt et al., 2018; McCarthy et al., 2020). We propose that whether environmental or health benefits of upcycled foods are communicated to consumers affects the perception of purchasing upcycled foods as morally self-rewarding, and in turn purchase intention. Environmental product benefits carry a relatively strong moral connotation, as communicating such benefits fits with acting environmentally-friendly which many consumers view as a moral issue (Van der Werff et al., 2013). Consumers viewing upcycled food mainly in terms of environmental benefits can create anticipated morally self-rewarding feelings to a greater extent. In contrast, when only health benefits of upcycled food are communicated, consumers view upcycled food as less of a moral issue (e.g., Lai et al., 2020), since being healthy primarily benefits oneself, therefore having weaker moral signalling consequences. Given the differing degrees of moral connotations potentially associated with communicating environmental versus health benefits of upcycled food, we expect that.

H1. Communication of environmental benefits of upcycled food products leads to stronger morally self-rewarding feelings associated with upcycled food, relative to communication of health benefits.

2.3. Framing communication based on level of abstraction

Regardless the extent to which an individual perceives the topic of upcycled food products psychologically distant, product benefits can be communicated towards consumers either more abstractly or concretely (Duan et al., 2021). Manipulating the level of abstraction at which a certain topic is communicated may be an effective approach to affect consumers' decision making. However, to date, to our knowledge no studies have examined the role of level of abstraction in communication of upcycled foods. Nevertheless, in the domain of organic food it has been shown that consumers view concrete messages as more credible than abstractly framed messages, though this does not translate into a higher purchase intention (Jaeger and Weber, 2020). Chang et al. (2019) showed that communicating specific, rather than generic, product claims about organic food led to a higher purchase intention. Furthermore, communicating about unhealthy products in terms of concrete nutrients can lead consumers to perceive these products as less

healthy than when abstract lifestyle consequences are communicated during product purchasing (Ronteltap et al., 2012). Similarly, in an online American study, Balcetis et al. (2020) found that concrete rather than abstract language increased the frequency of choosing healthy over unhealthy foods when indicating food preferences. Combined, these studies suggest that, at least in certain situations, concrete product communication is more effective than abstract communication when promoting food products that can be characterized as either sustainable or healthy. However, few insights exist on the potential underlying mechanism; thus the question remains why concrete (rather than abstract) product communication would be more influential in altering consumers' perceptions or actions.

We propose that part of the underlying mechanism lies in the effect of the level of abstraction of communicated product benefits on the moral signalling consequences of purchasing upcycled food. In general, consumers who are in a low-construal, concrete mindset view virtuous behaviours more positively, relative to consumers who are steered towards a high-construal, abstract mindset (Gong and Medin, 2012). This suggests that communicating about concrete (rather than abstract) benefits of upcycled food has stronger potential to boost morally self-rewarding feelings that consumers associate with purchasing upcycled food. Therefore, we expect that.

H2. Communication of concrete product benefits of upcycled food products leads to stronger morally self-rewarding feelings associated with upcycled food, relative to communication of abstract product benefits.

The final step in our explorative framework is to examine whether concrete versus abstract product communication and environmental versus health benefits ultimately lead to stronger purchase intention of upcycled food products through morally self-rewarding feelings. Given that anticipating morally self-rewarding feelings has been found to encourage consumers to purchase sustainable food (Arvola et al., 2008; Dowd and Burke, 2013), also specifically concerning food made from by-products (Altintzoglou et al., 2021), we expect that.

H3. Stronger morally self-rewarding feelings associated with upcycled food resulting from communication of environmental (rather than health) benefits (H_1) and concrete (rather than abstract) product benefits (H_2), in turn leads to a higher purchase intention for upcycled food

2.4. Current study

In the present study, we build on the work of Ronteltap et al. (2012) by operationalizing abstract product benefits in terms of fitting with a sustainable versus healthy lifestyle. We operationalize concrete health benefits by communicating about nutritional benefits of upcycled food (in line with Ronteltap et al., 2012). As for concrete environmental benefits, we build on the discussion of whether specific circular benefits of upcycled food should be communicated given that consumers typically have a negative association with materials considered to be prevented waste (Abbey et al., 2015), while it has also been reasoned that certain circular elements of upcycled food are viewed relatively positively by consumers (Aschemann-Witzel and Stangherlin, 2021). Consequently, we operationalize concrete environmental benefits by communicating about specific circular benefits of upcycled food in terms of contributing to waste prevention. This allows us to examine the added value of explicitly communicating about the circular aspects of upcycled food products, relative to other, more generic forms of communication not connected to the products' circular characteristics.

Furthermore, in the current study we use two upcycled food product cases: bean-based and insect-based upcycled food products. By-products of food production can be incorporated directly into the production of novel food products for consumers or indirectly, by feeding them to animals such as insects, which are subsequently used to produce food for consumers (Spratt et al., 2021). These specific product examples were based on existing Dutch companies that use by-products to make bean-

and insect food products for consumers. The first example is based on a company that makes meatball analogues (i.e., falafel) from 'wasted' vegetables and beans bought from local food producers. The other example is based on a Dutch company that processes locusts that have grown on residual flows from agriculture. Using both bean-based and insect-based upcycled foods allow us to explore the robustness of our findings across these types of upcycled food products (i.e., those containing upcycled food versus feed ingredients).

3. Method

3.1. Participants

An online study was conducted in November 2021 with a nationally representative sample of 2103 Dutch participants. The participants were recruited by a market research agency using a consumer panel (50.6% female, 49.4% male; age: 24% 18–34, 21.5% 35–49, 26.3% 50–64, 28.2% aged 65+ years). Informed consent was obtained from all participants, and the study was approved by an Ethical Committee of Wageningen University & Research.

3.2. Design, procedure & measures

Participants were first randomly assigned to one of two versions of the study, with one involving a bean-based upcycled product ($n = 1057$) and the other involving an insect-based upcycled product ($n = 1046$). Other than the specific product focused on, the two versions of the survey were identical. Within each version, a 2 (environmental versus health product benefits) \times 2 (concrete framed versus abstract framed product benefits) between-subjects design was employed; participants were randomly assigned to one of the four conditions. See Table 1 for an overview of the demographics of the different conditions.

Participants read that they would be presented with information about a food product that is a potential substitute for comparable meat products, like meatballs, after which participants were presented with an image of a meatball analogues product that was identical across conditions except for the packaging label. The image of the product was accompanied by a short text on the label that described either environmental or health product benefits, with the product description being either abstract or concrete. The packaging label only contained this text (i.e., there was no other product information available). The image and text used on the product packaging for all four conditions can be seen in Tables 2 and 3.

As a manipulation check for level of abstraction, participants responded to three items (adapted from Jaeger and Weber, 2020) concerning the perceived abstractness of the product information, using a 7-point Likert type scale (e.g., 1 = Not at all detailed, 7 = Very detailed; Cronbach's $\alpha = 0.87$). All subsequent items used a 7-point Likert type scale with 1 = *Completely disagree* and 7 = *Completely agree*. As a manipulation check for the product's perceived environmental and health benefits, participants responded to two items (adapted from Magnier et al., 2019; Mugge et al., 2017): "Eating this product can contribute to a cleaner environment" and "Eating this product can contribute to a better health".

Next, participants responded to three items concerning the degree to which they anticipated self-rewarding feelings from purchasing the product instead of a comparable meat product (Cronbach's $\alpha = 0.95$), adapted from Altintzoglou et al. (2021). Next, participants responded to three items measuring their intention to purchase the presented product based on the information they received about it (Cronbach's $\alpha = 0.98$), adapted from Mugge et al. (2017). All items of the measured constructs are listed in Table 4.

Table 1
Overview of the sample demographics per condition.

		Level of abstraction: concrete			Level of abstraction: abstract		
		Gender	Age	n	Gender	Age	n
Environmental product benefits	Bean-based upcycled product	F: 46.9%; M: 53.1%	18-34: 26.3%; 35-49: 18.5%; 50-64: 28.4%; 65+: 26.7%	243	F: 50%; M: 50%	18-34: 25.4%; 35-49: 19.3%; 50-64: 27.3%; 65+: 28%	264
	Insect-based upcycled product	F: 51.4%; M: 48.6%	18-34: 19.4%; 35-49: 27.1%; 50-64: 21.9%; 65+: 31.6%	288	F: 52%; M: 48%	18-34: 26.4%; 35-49: 17.2%; 50-64: 26.8%; 65+: 29.6%	250
Health product benefits	Bean-based upcycled product	F: 48%; M: 52%	18-34: 26%; 35-49: 24.2%; 50-64: 26.4%; 65+: 23.4%	273	F: 54.5%; M: 45.5%	18-34: 22.4%; 35-49: 21.3%; 50-64: 27.8%; 65+: 28.5%	277
	Insect-based upcycled product	F: 54.9%; M: 45.1%	18-34: 23.3%; 35-49: 20.2%; 50-64: 25.3%; 65+: 31.1%	257	F: 47%; M: 53%	18-34: 23.1%; 35-49: 23.5%; 50-64: 27.1%; 65+: 26.3%	251

Table 2
Images of the meatball analogues products used in the study.

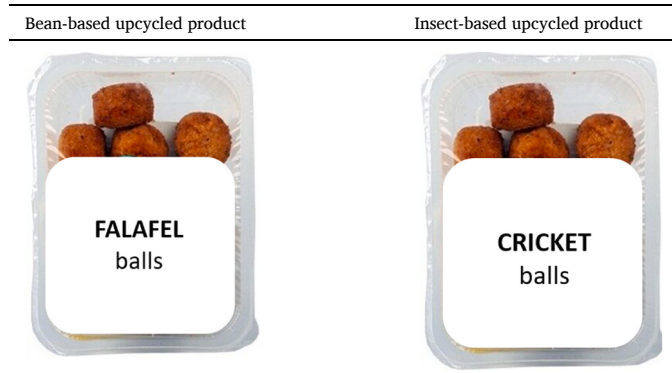


Table 3
Communication message upcycled food product per condition.

	Concrete communication	Abstract communication
Environmental product benefits	A source of protein based on beans [insects] that results in a lower ecological footprint . Made from ingredients which otherwise would have been wasted , such as small leftover vegetables, which contributes to less waste .	A source of protein based on beans [insects] that fits with a sustainable lifestyle . Made from sustainable ingredients which contribute to a cleaner environment .
Health product benefits	A source of protein based on beans [insects] that results in getting more healthy nutrients . Made from fibre-rich ingredients , which contribute to lowering the risk for cardiovascular diseases .	A source of protein based on beans [insects] that fits with a healthy lifestyle . Made from healthy ingredients which contribute to a living a healthier life .

Note. Please note that the original messages used in the study were in Dutch; these messages have been translated to English for the purpose of this manuscript. The message used was the same for the bean-based and insect-based upcycled product case, only in the first case the message states that the product is a source of protein based on beans, while in the second case the message states that the product is a source of protein based on insects.

Table 4
Means, standard deviations and Cronbach's alpha of all constructs in the survey.

Items per construct (all 7-point Likert scales)	Subsample: bean-based upcycled food		Subsample: insect-based upcycled food	
	Mean	SD	Mean	SD
Manipulation checks				
Construal level (adapted from Jaeger and Weber, 2020; 3 items) I believe that the product information is little detailed (1)/very detailed (7) ... very abstract (1)/very concrete (7) ... very generic (1)/very specific (7)	4.12	1.40	4.26	1.47
Perceived environmental benefits (adapted from Magnier et al., 2019; Mugge et al., 2017; 1 = totally disagree, 7 = totally agree; 1 item) Eating this product can contribute to a cleaner environment.	4.63	1.57	4.62	1.56
Perceived health benefits (adapted from Magnier et al., 2019; Mugge et al., 2017; 1 = totally disagree, 7 = totally agree; 1 item) Eating this product can contribute to a better health.	4.42	1.50	4.12	1.44
Moral signalling consequences associated with purchasing upcycled food				
Anticipated morally self-rewarding feelings (Altintzoglou et al., 2021; 1 = totally disagree, 7 = totally agree; 3 items) If I would buy this product instead of a comparable meat product, then I would feel like making a personal contribution to something better. ... This would feel like the morally right thing to do. ... This would make me feel like a better person.	3.81	1.61	3.53	1.62
Purchase intention upcycled food product (adapted from Mugge et al., 2017; 1 = totally disagree, 7 = totally agree; 3 items) Based on the information I have read about the product I am willing to buy this product some time. ... It is likely that I will buy this product some time. ... I would like to buy this product some time.	4.06	1.93	3.30	1.96

4. Results

4.1. Manipulation checks

4.1.1. Communicated environmental and product benefits of upcycled food

To examine whether the manipulation of the type of communicated product benefit was successful, two Analysis of Variance (ANOVAs) were performed. All analyses were conducted in SPSS 25.0. We first report the results of the subsample who completed the study for a bean-based upcycled product. For the first ANOVA, type of communicated benefit (sustainability vs. health) and level of abstraction (abstract vs. concrete) were used as the independent variables and perceived sustainability of the upcycled product was used as the dependent variable. This analysis showed that participants who had read about the product's environmental benefits perceived the product as more beneficial to the environment ($M = 4.96$) relative to participants who had read about health benefits ($M = 4.33$): $F(1, 1053) = 47.28, p < .001$, partial $\eta^2 = 0.043$. The second ANOVA was similar, only now with perceived health of the product as the dependent variable: participants who had read about health benefits perceived the product as more beneficial to their health ($M = 4.68$) than did those who had read about the environmental benefits ($M = 4.13$): $F(1, 1053) = 36.63, p < .001$, partial $\eta^2 = 0.034$. The findings were similar in the subsample who completed the study for an insect-based upcycled product. Participants who had read about environmental product benefits ($M = 4.86$) perceived the upcycled product as more beneficial to the environment relative to participants who read about health benefits ($M = 4.37$): $F(1, 1042) = 24.88, p < .001$, partial $\eta^2 = 0.023$. Also, participants who had read about the product's health benefits perceived the upcycled product as more beneficial to their health ($M = 4.34$) than did participants who read about environmental benefits ($M = 3.92$): $F(1, 1042) = 22.96, p < .001$, partial $\eta^2 = 0.022$.

4.1.2. Level of abstraction

We conducted similar ANOVA's as in the previous section to examine whether our manipulations regarding level of abstraction were successful. In the subsample who completed the study for a bean-based upcycled product, participants who saw the concrete framed product benefits indeed perceived the product information as more concrete ($M = 4.49$) than did participants who saw the abstract framed product benefits ($M = 3.77$): $F(1, 1053) = 77.69, p < .001$, partial $\eta^2 = 0.069$. The level of abstraction manipulation was also successful in the insect-based upcycled product subsample: participants who saw the concrete framed product benefits perceived the product information as more concrete ($M = 4.65$) relative to participants in the condition in which product benefits were communicated in an abstract fashion ($M = 3.84$): $F(1, 1042) = 83.65, p < .001$, partial $\eta^2 = 0.074$.

4.2. Moral signalling consequences

We conducted an ANOVA to test whether participants perceive more morally self-rewarding feelings associated with purchasing upcycled food product (rather than a comparable meat product) when 1) environmental benefits are communicated, as opposed to health benefits (H_1) and 2) benefits are communicated concretely, as opposed to abstract (H_2). Again, we first report the results of the subsample who completed the study for a bean-based upcycled product. As expected (H_1), the ANOVA showed that participants perceived stronger morally self-rewarding feelings when environmental benefits were communicated to participants ($M = 3.93$) rather than health benefits ($M = 3.71$; $F(1, 1053) = 5.40, p = .020$, partial $\eta^2 = 0.005$). Also, stronger morally self-rewarding feelings were associated with purchasing the upcycled product among participants who read about concrete framed product benefits ($M = 4.04$) rather than benefits framed in a more abstract manner ($M = 3.60$; $F(1, 1053) = 20.67, p < .001$, partial $\eta^2 = 0.019$), in line with H_2 . We also tested the interaction effect between the type of

communicated product benefit (sustainability, health) and level of abstraction (concrete, abstract) on perceived self-rewarding feelings. No significant interaction was found: $F(1) = 1.05, p = .306$, partial $\eta^2 = 0.001$.

The same analysis was conducted for the insect-based upcycled product subsample: participants perceived stronger morally self-rewarding feelings associated with purchasing the product when environmental benefits were communicated ($M = 3.63$) rather than health benefits ($M = 3.42$; $F(1, 1042) = 4.10, p = .043$, partial $\eta^2 = 0.004$), in line with H_1 , and when participants read about concrete framed product benefits ($M = 3.73$) rather than abstract framed benefits ($M = 3.32$; $F(1, 1042) = 16.54, p < .001$, partial $\eta^2 = 0.016$), in line with H_2 . There was no significant interaction between the type of communicated benefit and level of abstraction: $F(1) = 1.07, p = .302$, partial $\eta^2 = 0.001$, though we did expect this (H_2).

4.3. Effect of product benefit & level of abstraction on purchase intention (via morally self-rewarding feelings)

In the following analyses, we examine to what extent the communication of health versus environmental product benefits, either concrete framed or abstract framed, affects the extent to which participants perceive morally self-rewarding feelings, and in turn participants' purchase intention for the upcycled product. Firstly, we report an ANOVA to test the direct effect of communicating health versus environmental product benefits, framed concrete or abstract, on purchase intention. Secondly, this is followed by a mediation analysis which tests the proposed indirect effect of communicating health versus environmental benefits, framed concrete or abstract, on purchase intention, via morally self-rewarding feelings. Again, we first report the findings for the bean-based upcycled product subsample. The ANOVA showed that purchase intention of the bean-based upcycled product did not differ between participants who read about environmental benefits of the product ($M = 4.03$) compared to those who had read about the product's health benefits ($M = 4.08$; $F(1, 1053) = 0.23, p = .630$, partial $\eta^2 < 0.001$), but purchase intention was significantly higher among participants who read about concrete framed product benefits ($M = 4.28$) rather than abstract framed benefits ($M = 3.85$; $F(1, 1053) = 12.97, p < .001$, partial $\eta^2 = 0.012$). There was no significant interaction between the type of communicated benefit and abstractness level on purchase intention: $F(1, 1053) = 0.75, p = .784$, partial $\eta^2 < 0.001$.

Subsequently, we conducted a mediation analysis for the bean-based upcycled food subsample using a mediation macro from Hayes and Preacher (2012), with morally self-rewarding feelings as mediator.¹ All variables were standardized for the analyses. First, the analyses showed that both type of communicated benefit (health or sustainability; $\beta = -0.14, t = -2.30, p = .022$) and abstractness level (concrete or abstract; $\beta = 0.27, t = 4.51, p < .001$) had an effect on morally self-rewarding feelings associated with purchasing the upcycled product, in line with findings reported in 3.2. The stronger morally self-rewarding feelings were, the higher participants' purchase intention ($\beta = 0.64, t = 27.09, p < .001$). The 95% bootstrapped confidence intervals (CI's) indicated the presence of the hypothesized indirect effect of both types of communicated product benefit (95% bootstrapped CI [-0.17, -0.02]) and abstractness level (95% bootstrapped CI [0.10, 0.25]) on purchase intention via perceived morally self-rewarding feelings, in line with H_3 . See Fig. 1 for an overview of the mediation model.

Subsequently, the same mediation analysis was conducted for the insect-based upcycled food subsample. The ANOVA showed that

¹ We used this mediation macro instead of SPSS PROCESS because the use of the macro allows for multiple independent variables to be included in the model. Also, because indirect-only mediation is possible (Zhao et al., 2010), we ran the mediation model even though not all direct effects on purchase intention were statistically significant.

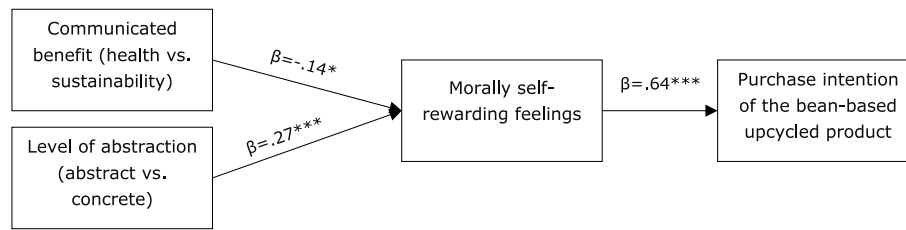


Fig. 1. Indirect-only mediation model: indirect relation between communicated benefit and level of abstraction and purchase intention of the bean-based upcycled product through morally self-rewarding feelings.

purchase intention did not differ between participants who read about environmental benefits ($M = 3.25$) compared to those who had read about the product’s health benefits ($M = 3.34$; $F(1, 1042) = 0.56, p = .456$, partial $\eta^2 = 0.001$); similarly, purchase intention did not differ between participants who read about concrete framed benefits ($M = 3.37$) or abstract framed benefits ($M = 3.21$; $F(1, 1042) = 1.87, p = .172$, partial $\eta^2 = 0.002$). There was no significant interaction between the type of communicated benefit and level of abstraction: $F(1, 1042) = 0.32, p = .571$, partial $\eta^2 < 0.001$. Subsequently, mediation analyses (with morally self-rewarding feelings as mediator) showed that both type of communicated benefit (health or sustainability; $\beta = -0.13, t = -2.07, p = .039$) and level of abstraction (concrete or abstract; $\beta = 0.25, t = 4.10, p < .001$) had an effect on morally self-rewarding feelings associated with purchasing the insect-based upcycled product, in line with findings reported in 3.2. The stronger perceived morally self-rewarding feelings were, the higher participants’ purchase intention ($\beta = 0.57, t = 22.34, p < .001$). The 95% bootstrapped CI’s indicated the presence of the hypothesized indirect effect of both type of communicated product benefit (95% bootstrapped CI [-0.14, -0.01]) and abstractness level (95% bootstrapped CI [0.07, 0.22]) on purchase intention via morally self-rewarding feelings, in line with H_3 . See Fig. 2 for an overview of the mediation model.

5. Discussion

5.1. Overview of results

Currently, upcycled food products are a relative novelty on consumer markets. Increasing consumer adoption of upcycled food products has the potential to contribute to a more sustainable, circular food system. The current study shows that how upcycled food is communicated towards consumers affects their purchase intention, because variations in communication lead to variations in the moral signalling consequences that consumers associate with purchasing upcycled food. When concrete (rather than abstract) framed communication about upcycled food is presented to consumers (i.e., information about concrete circular or nutritional benefits of upcycled food rather than more abstract environmental or healthy lifestyle benefits), this increases the extent to which consumers anticipate morally self-rewarding feelings associated with purchasing upcycled food. More specifically, participants perceived stronger morally self-rewarding feelings when environmental benefits were communicated to participants rather than health benefits

and when reading about concrete framed product benefits rather than benefits framed in a more abstract manner. In turn this positive moral signalling effect leads to a higher intention to purchase upcycled food.

It should be noted that though this indirect conditional effect was present in both product cases included in our study, i.e., bean-based upcycled food and insect-based upcycled food, the direct effect of the product information’s level of abstraction on purchase intention was only significant in the case of bean-based upcycled food. This suggests that this positive moral signalling effect as a result of concrete communication was only strong enough to translate into a higher purchase intention for upcycled food in the case of bean-based, but not insect-based, upcycled food. One possible reason is the small difference in effect size of level of abstraction on anticipated morally self-rewarding feelings between the two subsamples: this effect was slightly larger among participants presented with a bean-based upcycled product. A different explanation concerns the many potential barriers to consumer adoption of insect-based products that have been identified in previous work. For example, research shows that insect-based food products are associated with feelings of disgust (e.g., Dagevos and Taufik, 2023) and insect-based products overall score relatively low in terms of consumer acceptance relative to other forms of alternative proteins (Onwezen et al., 2021).

5.2. Variations in communication: abstract versus concrete and environmental versus health benefits

Our findings indicate that stressing the concrete, circular element of upcycled food products (i.e. the use of ingredients that otherwise would have been wasted) is of added value to consumers (cf. Dagevos and Taufik, 2023), but the same can be stated about stressing concrete, nutritional benefits which also provided a moral boost, relative to abstract product benefits. The fact that we did not find any significant interaction effects between the type of communicated benefit and level of abstraction implies that the moral signalling consequences are not stronger for concrete product benefits when the benefits concern environmental rather than health benefits. This may be contrary to what could have been expected based on our finding that participants perceived stronger morally self-rewarding feelings when environmental benefits were communicated rather than health benefits. One potential reason why concrete environmental and health product benefits had a similar effect on the products’ moral signalling consequences, relative to respectively abstract environmental and health benefits, might be that

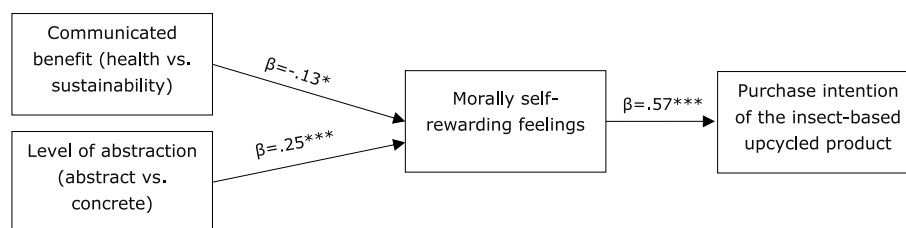


Fig. 2. Indirect-only mediation model: indirect relation between communicated benefit and level of abstraction and purchase intention of the insect-based upcycled product through morally self-rewarding feelings.

consumers find concrete product communication more transparent than abstract communication, regardless of the type of product benefit. [Peschel and Aschemann-Witzel \(2020\)](#) show that greater transparency about upcycled food (i.e., information that is relatively clear, understandable and precise) has the potential to make consumers' evaluation of upcycled foods more positive, though findings were mixed. If consumers find concrete product information of upcycled foods more transparent (regardless of whether the communicated benefits concern the environment or health), then it might become more likely that the purchase of upcycled foods will be associated with being morally self-rewarding, simply because it is more clear to consumers what the product benefits entail. Future research can examine this alternative explanation why concrete communication of upcycled foods has greater moral signalling consequences than abstract communication, regardless of whether environmental or health benefits of upcycled foods are communicated.

5.3. Moral signalling: morally self-rewarding feelings

Our study shows that the examined types of product communication of upcycled food had moral signalling consequences in terms of the extent to which consumers associated purchasing upcycled food with morally self-rewarding feelings. These results extend the findings of [Aschemann-Witzel et al. \(2022\)](#) regarding communicating potential benefits of upcycled foods, as our findings indicate that framing such benefits in a concrete manner has positive effects on the moral signalling consequences of upcycled foods and in turn on consumers' intention to purchase upcycled foods. However, previous studies indicate that there is also a certain risk involved regarding moral signalling, namely that consumers associate the purchase of sustainable (and in particular plant-based) foods with an anticipation of being viewed as a moral do-gooder (i.e., anticipated moral stigma; [Bolderdijk and Cornelissen, 2022](#); [Markowski and Roxburgh, 2019](#)). Future research might further examine to this downside of moral signalling in relation to the consumers' attitude to and consumption of upcycled food products.

5.4. Practical implications

As [Ye et al. \(2022\)](#) have noted, in recent years several large food manufacturers have started to invest in the development of novel upcycled food products, as they envision sufficient market potential for these types of products to become successful. To ultimately translate this market potential into market success, it is relevant for practitioners to communicate about upcycled food products in a way that appeals to consumers so that consumers will purchase these products. Our study findings provide some initial guidelines for practitioners on what to take into account when communicating about upcycled food products. For instance, the design of marketing campaigns or the design of the product packaging of upcycled food products can highlight concrete benefits in terms of circularity (minimizing or preventing waste) or health (specific nutritional benefits that prevents cardiovascular diseases) to first boost the extent to which consumers associate the purchase of upcycled food with signalling something positive about themselves in terms of morality, and subsequently boost the likelihood that consumers will buy upcycled food products. Thus, even though research has shown that consumers have a negative association with waste ([Abbey et al., 2015](#)), also when it comes to upcycled food products ([de Visser-Amundson et al., 2021](#)), our findings indicate that highlighting concrete circular benefits in terms of waste prevention can actually boost these products' (moral) signalling potential and in turn consumers' purchase intention.

5.5. Limitations & future research

Our studies have some limitations, which also raise a number of avenues for future research. First, the present study lacks a measure for actual buying behaviour regarding upcycled food products. Previous

research has shown that there is a gap between intention and behaviour, as intending to perform a certain behaviour does not necessarily lead to actually performing the behaviour ([Sheeran and Webb, 2016](#)). Thus, participants' intentions to purchase upcycled food products in the present study do not guarantee that they would buy these products outside the experimental set-up of our study; future research can extend the current study by including an actual behavioural measure. Second, in our study we used fictitious upcycled food products, raising the question to what extent participants would have responded similarly when upcycled products would have been used including the description of for instance a brand and product price. It should be noted that the products used in our study were based on upcycled food products that actually exist in the Netherlands (where the present study was conducted), though these products are not widespread yet in The Netherlands in terms of availability. Future research can for instance explore to what extent our findings can be replicated in a field experiment, where consumers can actually purchase similar upcycled food products as the ones used in our study. Third, in our study we operationalized abstract benefits in terms of environmental or health lifestyle benefits and concrete benefits in terms of specific circular (preventing waste) or nutritional benefits (preventing cardiovascular diseases). The question remains to what extent similar findings would be found with different operationalizations, as there are several dimensions along which product information can be made either more concrete or abstract (e.g. [Trope and Liberman, 2010](#)). For instance, [Jaeger and Weber \(2020\)](#) operationalized concrete health messages about organic food products in terms of vitamin intake to boost one's immune system and abstract health messages in terms of boosting one's well-being and feeling fit in the future. Future research can test the effectiveness of various operationalizations of concrete and abstract messages of upcycled food to further examine how to boost consumer adoption of upcycled food through product communication.

5.6. Conclusions

To conclude, our study indicates that the way upcycled food is communicated towards consumers affects what consumers believe that buying upcycled food signals about them in terms of morality, particularly the extent to which consumers view buying upcycled food as morally self-rewarding. Stressing certain concrete product benefits of upcycled food products when marketing these products, such as specific circular benefits or health benefits, can contribute to unlocking the market potential of upcycled food and assist in changing upcycled food products from a relative novelty, low-adoption product into to a more mainstream, higher-adoption consumer product.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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