WEARING PINEAPPLE LEAVES?

2023

CONSUMER RESPONSES TO FASHION PRODUCTS MADE FROM REPURPOSED MATERIALS

Xin Gao

Propositions

1. Consumers perceive fashion products made from repurposed materials to be of lower quality compared to those made from conventional ones.
(this thesis)

2. Fashion products made from repurposed materials sell better when repurposed materials look similar to conventional ones.
(this thesis)

3. Non-significant findings deserve more attention from scientists than significant findings.

4. It is the state of struggling to understand something that makes doing a PhD meaningful.

5. Courage is more important than rationality in building a civic society.

6. Consumerism encouraged by modern society bribes human beings to be unsustainable.

Propositions belonging to the thesis, entitled

Wearing pineapple leaves? Consumer responses to fashion products made from repurposed materials

Xin Gao

Wageningen, 5th April 2023 (Date defence ceremony)

Wearing pineapple leaves?

Consumer responses to fashion products made from repurposed materials

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Wearing pineapple leaves?

Consumer responses to fashion products made from repurposed materials

Xin Gao

Thesis

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Chapter 1

General introduction

1.1 Introduction

The fashion industry has a profound, negative impact on the environment. It is responsible for around 10% of global CO_2 emissions, 20% of industrial water pollution caused by textile treatment and dyeing, 35% of primary microplastic pollution each year, a vast amount of textile waste, and the consumption of extensive amounts of water (Niinimäki et al., 2020). The primary source of this negative impact is the materials used for fashion products. The conventionally used materials for fashion products, both agriculture-based (e.g., cotton, leather) and petroleum-based (polyester, nylon), require the use of a lot of water and chemicals and generate a vast amount of pollution during the processing. For example, it takes approximately 2000 litres of water to produce a single cotton T-shirt (Hoekstra & Chapagain, 2006). In addition, cotton textile processing, such as pre-treatment and dyeing, generates many residual chemicals (Babu et al., 2007). Making the environmental issue worse, brands frequently introduce new trends of fashion products made from conventional materials, resulting in overproduction and a massive amount of waste (Pucker, 2022). The fashion industry doubled production from 2000 to 2015 (Euromonitor International, 2016), but less than 1% of materials for clothing were recycled to make new garments (Ellen MacArthur Foundation, 2017). Thus, the overproduction of fashion products made from conventional materials causes substantial damage to the environment.

One way to reduce the negative environmental impact of the fashion industry is to replace conventional materials with repurposed materials to produce fashion products. Repurposed materials are, in this thesis, defined as materials whose own conventional use is changed into a new use. Various materials can fall under the concept of repurposed materials for fashion products, such as agricultural waste (e.g., leaves and rinds), recycled goods (e.g., plastic bottles and fishing nets), or newly developed materials (e.g., kelp, fungal mycelium, bamboo). Compared to conventional materials, repurposed materials are less resource-intensive and polluting (Hazarika et al., 2017; Jones et al., 2021; Ribul et al., 2021). For example, manufacturing fungal mycelium requires low to negligible external energy. Fungal mycelium only needs by-products, such as sawdust, to grow on (Elsacker et al., 2019), and it is fully biodegradable at the end of its service life (Gandia et al., 2021). As manufacturing repurposed materials is less resource-intensive and not more complicated than conventional materials, repurposed materials have the potential to be profitable for business and industry (Debnath, 2016; Jones et al., 2021). Repurposed materials' environmental and commercial benefits could gradually stimulate the fashion industry to replace conventional materials with repurposed materials.

Although replacing conventional materials with repurposed materials is one way to achieve sustainable fashion, it is not certain that fashion products made from repurposed materials will be successful. Generally, up to 40% of newly launched products fail (Castellion & Markham, 2013). This thesis focuses on one factor that is essential for product success: consumer responses to such novel products. After all, if consumers respond negatively to fashion products made from repurposed materials, neither the environmental nor commercial potential of these products will be fully reached.

This thesis starts with considering possible changes that occur in fashion products when conventional materials are replaced with repurposed materials. I propose that three changes in fashion products could be salient: the material's purpose, product exposure frequency, and product attributes. These three changes in fashion products caused by material replacement might make consumers respond differently to fashion products made from repurposed materials than those made from conventional materials. By studying various consumer responses to fashion products made from repurposed materials within which these changes are involved, the thesis attempts to infer potential psychological processes evoked by material replacement. Therefore, the goal of this thesis is to understand how consumers respond to fashion products made from repurposed materials to contribute theoretical implications for consumer and marketing research and practical implications for product designs and marketing strategies.

1.2 Material's purpose and schema congruity theory

The change of the material's purpose refers to the concept of "repurposing"—the material's conventional use is altered to make fashion products. For example, bamboo is conventionally used for construction because of its extraordinary tensile strength, but it can be repurposed as fabric for T-shirts. This change of the material's purpose in the product may bring atypicality to the product, influencing consumer responses. The current thesis defines atypicality as the degree of perceived discrepancy between a product and a particular product category (Meyers-Levy & Tybout, 1989).

Historically, atypicality in products has been well-noticed. For example, Francis Bacon observed that “there is no excellent beauty that hath not some strangeness in the proportion” (from the 1600s). Raymond Loewy proposed the MAYA principle (from the 1950s) of product design, meaning that the design of a product should be “most advanced yet acceptable”. Both pointed out that consumers can quickly get bored with a product that is not atypical at all but reject a product that is too atypical. Therefore, consumers would prefer some atypicality in a product. Unravelling the cognitive processes underlying this phenomenon would be helpful for product designers to put “the right proportion of strangeness” in the product.

Schema congruity theory focuses on a specific source of atypicality, namely “incongruity”, which refers to the perceived mismatch between the product and the activated category (Jhang et al., 2012; Mandler, 1982). Schema congruity theory proposes that the process of resolving incongruity in products influences consumers’ evaluation of the product (Meyers-Levy & Tybout, 1989). Specifically, the theory argues that a larger incongruity between the product attribute and the activated category increases the difficulty for consumers to make sense of the product. Therefore, more cognitive effort is needed to understand the product (Peracchio & Tybout, 1996). Successfully resolving incongruity in the product would evoke more positive affect, such as curiosity and interest, but failing to resolve incongruity would lead to negative affective states, such as anxiety and frustration (Berlyne, 1966; Mandler, 1982). These affective states evoked during the resolving process of incongruity can be one important factor in influencing consumers’ evaluation of the product: consumers could attribute positive affective states to positive product evaluations and negative affective states to negative product evaluations (Noseworthy et al., 2014). When consumers perceive the product to be congruent with the product category, they respond to it mildly positively because they like objects that are conform to their expectations (Meyers-Levy & Tybout, 1989). Schema congruity theory thus predicts that, moving from congruent to incongruent products, consumers’ product evaluations first increase and then decrease, resembling an inverted U shape, consistent with Francis Bacon's argument on strangeness and beauty and Raymond Loewy's MAYA principle.

Schema congruity theory may be used to predict consumer evaluations to fashion products made from repurposed materials. The change of repurposed materials' original purpose to the new purpose as fashion materials could evoke incongruity perceptions. For example, when encountering a bamboo T-shirt, consumers may perceive the soft bamboo fabric to mismatch with their knowledge that bamboo is a strong construction material. Consumers then need to resolve this incongruity by updating their knowledge about bamboo materials. Positive affect experienced after successfully resolving this incongruity could increase consumers' evaluation of such products. When the incongruity in the fashion product made from repurposed material is perceived to be too large to resolve, consumers might fail to resolve this incongruity. Failure to resolve the incongruity could evoke negative affect, which in turn can decrease evaluations of such products. Therefore, when following schema congruity theory, it can be predicted that the degree of incongruity that consumers perceive in fashion products made from repurposed materials would influence consumers' evaluations of such products in an inverted U shape relation. Whether schema congruity theory can be applied to consumers' evaluation of fashion products made from repurposed materials, however, has not been empirically examined.

1.3 Exposure frequency and atypicality perception

When conventional materials are replaced by repurposed materials, another salient change is that consumers might less frequently encounter fashion products made from repurposed materials compared to products made from conventional materials. The supply chain and manufacturing equipment for conventional materials have already been well established, whereas fashion products made from repurposed materials are currently produced on a relatively small scale (Fletcher & Grose, 2012; Niinimäki et al., 2020). These supply issues together create the situation that consumers are less frequently exposed to fashion products made from repurposed materials than those made from conventional materials.

One of the consequences of a lower exposure frequency of a product is that consumers may consider the product to be atypical (Loken & Ward, 1990). In the previous section, I considered incongruity as a specific source of atypicality, namely the perceived mismatch between the product and the product category. Lower product exposure frequency can be considered as another source of atypicality. As product exposure frequency and product incongruity are not necessarily related to each other, I argue that at least these two factors can predict atypicality perceptions of fashion products made from repurposed materials. This raises the question whether there are more factors that predict consumers' atypicality perceptions of fashion products repurposed materials.

Moreover, given that two factors, perceived incongruity and exposure frequency, may predict atypicality perceptions of different products in general, increasing insight into whether, and if so what, additional factors can predict atypicality perceptions across different products can be important for product innovation. Such factors can shed light on, for example, product evaluations and product purchases (Chowdhury, 2007; Liu et al., 2020; Scarpi et al., 2019; Spielmann, 2016), on consumers' emotional and physical responses (Gerrath & Biraglia, 2021; Noseworthy et al., 2014), and on strategies that consumers apply to understand new products (Gregan-Paxton & Moreau, 2003; M. Zhao et al., 2012).

The literature on atypicality in products indeed suggests that different factors may predict consumers' atypicality perceptions of products. These factors have been identified in separate lines of research related to product atypicality. Thus far, I propose that three lines of research could be relevant. Besides the already mentioned incongruity research (Meyers-Levy & Tybout, 1989) and research on product typicality (Loken & Ward, 1990), research on product newness may also provide some insights into relevant factors influencing consumers' atypicality perceptions of products (Hoeffler, 2003). Research on incongruity focuses on the degrees of perceived mismatch between a product and an activated product category (Jhang et al., 2012; Mandler, 1982). Research on typicality examines factors that distinguish typicality from atypicality, such as exposure frequency or familiarity (Loken & Ward, 1990). The product newness literature emphasizes new benefits that products may bring to consumers (Hoeffler, 2003). As new benefits of products might enable consumers to do things they have not been able to do previously (Hoeffler, 2003; Veryzer, 1998), products with these new benefits could evoke atypicality perceptions in consumers. Factors such as incongruity, exposure frequency, and new product benefits may all be understood as different sources causing discrepancy perceptions between a product and a particular product category (Meyers-Levy & Tybout, 1989).

To the best of my knowledge, no research thus far has combined these different factors into one framework to understand atypicality perceptions of products. It is currently not clear whether and to what extent these separate research lines provide overlapping or distinct factors predicting atypicality perceptions in general, and specific fashion products made from repurposed materials in particular. It needs to be further clarified whether the factors that were previously identified by different research lines can be applied to fashion products made from repurposed materials. Finally, more factors might predict atypicality perceptions of new products in general, but they might have so far been overlooked. Therefore, there is a need for exploration on this topic.

1.4 Levels of attributes and trade-offs

Many product attributes in fashion products may change when conventional materials are replaced with repurposed materials. For example, shape, strength and texture of repurposed materials could be different from that of conventional materials when materials are used for textile (Hazarika et al., 2017). The changes in product attributes consequently can lead to changes in consumer perceptions of the product attributes, affecting consumer responses to the products (Polyportis et al., 2022). Therefore, it is valuable to examine how product attributes of fashion products made from repurposed materials affect consumer responses to such products. The first step is to select the relevant product attributes that play a role in consumer responses to fashion products made from repurposed materials.

I selected specific attributes of fashion products based on Rogers’ framework of diffusion of innovations (2004). This framework highlights five attributes of innovation that predict the product’s rate of adoption: relative advantage, compatibility, complexity, trialability and observability of the innovation. I argue that three of these five attributes proposed by Rogers (2004) could be relevant to fashion products made from repurposed materials: compatibility, relative advantage and observability. Two attributes of innovation, complexity and trialability, proposed by Rogers (2004) might be less relevant to fashion products made from repurposed materials. The trialability attribute might be less relevant because trying out fashion products made from repurposed materials is unlikely to help consumers understand the core benefits of repurposed materials (sustainability) better. The complexity attribute refers to the difficulty of learning how to use the innovation. While some fashion products made from repurposed materials may require new way of using or wearing (e.g., a jacket without a zipper), in the current thesis I focus on regular fashion products, such as T-shirts, shoes and backpacks, which do not require consumers to learn how to use them. The following paragraphs introduce the three specific attributes of fashion products that I selected to represent Rogers' three attributes of innovation and possible effects of the specific attributes on consumer responses.

The function attribute of fashion products can be relevant to the compatibility attribute of innovation. The function of fashion products refers to the product quality, such as the breathability of T-shirts, or the sturdiness of bags. In general, consumers treat the product function as the central value of a product and attach extensive importance to the degree to which the product fulfils its function (Chitturi et al., 2008). Therefore, to accept fashion products made from repurposed materials, consumers need to perceive the function of fashion products made from repurposed materials to be comparable with that of fashion products made from conventional materials, for example bamboo T-shirts need to be soft and pineapple leather bags need to be sturdy. However, repurposed materials may evoke inferior function perceptions compared to conventional materials. This perception may be enhanced when consumers perceive repurposed materials sustainable. Research indicates that consumers are likely to associate more sustainable products with lower expectation of functionality (Luchs et al., 2010; Newman et al., 2014). Hence, even though fashion products made from repurposed materials mimic conventional products, it is not clear whether functional compatibility is perceived. It is currently unclear whether emphasizing the function superiority of repurposed materials in fashion products can change consumer perceptions of the function of repurposed materials, and whether this change can eventually lead to more positive consumer responses to the fashion products made from repurposed materials.

The sustainability attribute in fashion products can reflect the relative advantage attribute of innovation from Roger's framework (2004). Research has demonstrated the sustainability advantage of repurposed materials to make fashion products, compared to conventional materials (Hazarika et al., 2017; Ribul et al., 2021). Thus, the sustainability attribute could be a relative advantage of repurposed materials. However, it is unclear whether consumers perceive this relative advantage of repurposed materials compared to conventional materials. Given that the sustainability advantage could be an important reason for consumers to purchase the fashion products made from repurposed materials, empirical research is needed to examine consumers' perceptions of and responses to the sustainability attribute in fashion products made from repurposed materials.

Material's visual distinguishability can reflect the observability attribute of innovation from Roger's framework (2004). Observability means the degree to which the results of an innovation are visible to others. Repurposed materials, as the innovative part of fashion products, can be either visually distinguishable or not distinguishable from conventional materials. When wearing fashion products made from repurposed materials that are visually distinguishable from conventional materials, other consumers are more likely to recognize the repurposed materials. When consumers perceive repurposed materials to be more sustainable than conventional materials, visually distinguishable repurposed materials are more likely to signal a symbolic value of sustainability. Choosing a sustainable product may imply consumers' social identity (Noppers et al., 2015). The costly signalling theory proposes that consumers who purchase sustainable products that are inferior in function compared to luxury products that are superior in function signal to other people that they have sufficient resources to afford the negative impact of products with an inferior function (Griskevicius et al., 2010). However, other research suggests that consumers may behave pro-environmentally (e.g., buying sustainable products) to establish their self-identity, regardless of visibility to others (Castagna et al., 2022). To what extent either explanation predicts how material distinguishability influences consumer responses to fashion products made from repurposed materials still needs to be determined.

Moreover, trade-offs between the three attributes function, sustainability and distinguishability, may occur when consumers make purchase decisions. Hardly any products is perfect on all attributes that consumers desire. Therefore, consumers have to compare different attributes for various products to make their product choices (Luchs et al., 2012). For example, research has shown that consumers are more likely to choose a product with a function advantage over a product with a sustainability advantage (Luchs et al., 2012). Thus, the trade-offs between the three attributes function, sustainability, and visual distinguishability need to be considered when studying consumer responses to fashion products made from either repurposed or conventional materials.

1.5 Aim and Research Questions

This thesis aims to answer the research question:

How do consumers respond to fashion products made from repurposed materials?

To answer this research question, the thesis proposes to look at three substantial changes occurring in fashion products when conventional materials are replaced with repurposed materials: the change of the material's purpose, the change of the exposure frequency to fashion products made from repurposed materials, and the change of attributes of fashion products made from repurposed materials. By examining consumer responses to fashion products made from repurposed materials involving these changes, the thesis contributes to a more comprehensive understanding of the psychological processes evoked by changes brought by material replacement in fashion products (Figure 1.1).

Chapter 2 focuses on the repurposing of the materials from their original use to the new use as fashion materials. Chapter 2 studies a specific form of atypicality—incongruity, referring to the perceived mismatch between the product and the product category. The original purpose of repurposed materials may mismatch with its new use as fashion materials. For example, bamboo as a hard construction material needs to be soft enough for making T-shirts. Schema congruity theory predicts an inverted-U shape relationship between perceived incongruity (mismatch) and product evaluation. Chapter 2 presents multiple experiments in which various combinations of materials and fashion products were used to evoke different levels of incongruity perceptions. The experiments measured consumers' product evaluations as consumer responses. This chapter examined the relationship between consumers' incongruity perceptions and their evaluations of fashion products made from repurposed materials. It also examined the reasons why consumers perceived repurposed materials to be more incongruent with the product category than conventional materials. Thus, chapter 2 answers the specific research question *whether schema congruity theory can be applied to predict consumers' evaluation of fashion products made from repurposed materials*.

Chapter 3 is inspired by the realisation that a lower exposure frequency to fashion products made from repurposed versus conventional materials provides a different perspective on atypicality. In chapter 2, product incongruity is treated as a specific form of atypicality. Exposure frequency could be another unique factor to predict atypicality perceptions in fashion products made from repurposed materials. The realisation that different factors can predict atypicality perceptions, raised the question whether there are more unique factors that can predict atypicality perceptions in fashion products made from repurposed materials. Therefore, in chapter 3 I conducted an exploratory study that aimed to identify such factors across various product categories, including fashion products. To do so, consumers were presented with products from a broad range of product categories and asked to write down whether, and if so why, they considered each product to be (a)typical. Factors predicting atypicality perceptions were aggregated from reasons that consumers wrote down. Identifying factors predicting atypicality perceptions in various products allowed me to explore which factors could predict consumers' atypicality perceptions of specific fashion products made from repurposed materials in the context of a broad range of innovative products. To link these factors to consumer responses to the products, I also asked consumers to indicate the information they would like to know about the products, and their experienced emotions towards the products. With these consumer-generated contents, chapter 3 further explored the associations between specific factors predicting atypicality perceptions, information and emotions across different products, which were then applied to fashion products made from repurposed materials. Together, chapter 3 answers the research question *what factors can predict atypicality perceptions of products (in general, and specifically for fashion products made from repurposed materials), and how are these factors associated with consumers' need for different information and their emotions*.

Chapter 4 focuses on the change of three product attributes of fashion products: function, sustainability and distinguishability, which correspond to Rogers' (2004) attributes of innovation: compatibility, relative advantage and observability . A series of experiments was conducted to examine the effects of these three attributes and potential trade-off effects between these attributes on consumer responses to fashion products made from repurposed and conventional materials. We studied consumer responses as the evaluation of a single product and as the choices between two fashion products. Together, the findings of chapter 4 answer the sub-research question *how do function, sustainability, and distinguishability product attributes and their trade-offs influence evaluations and choices of fashion products made from repurposed and conventional materials*.

Chapter 5 summarizes the findings of the thesis and discusses theoretical and practical implications. Reflections on methodology, suggestions for future research and limitations of the thesis are discussed.

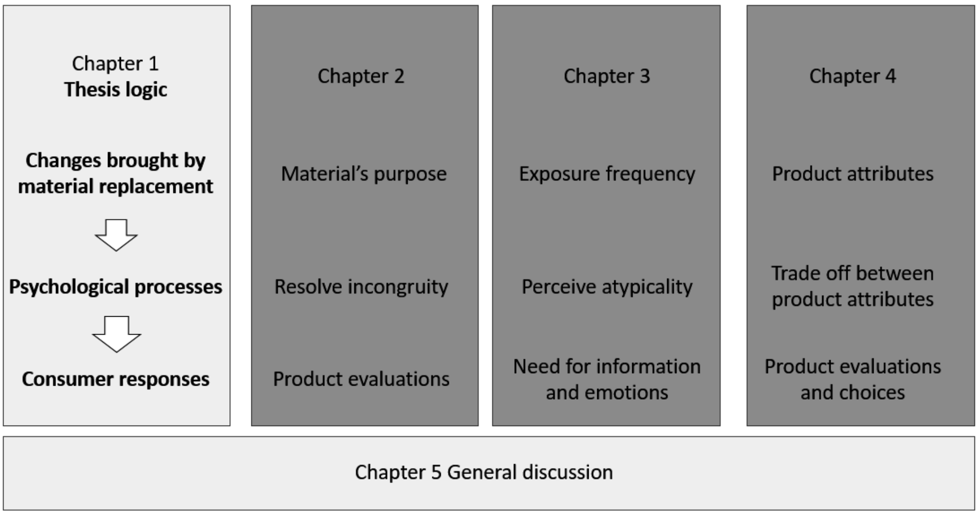

Figure 1.1 Thesis outline

Chapter 2
Something underneath? Using a within-subjects design to examine Schema Congruity Theory at an individual level

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Abstract

Previous research has shown that perceived incongruity affects product evaluations in an inverted U shape. However, it remains unclear whether this relation also occurs at individual levels with continuous incongruity measures, and for products made from repurposed materials. Five within-subjects studies do not show the inverted U relation across all participants. Instead, consumer subgroups show a monotonic relation: higher congruity leads to higher product evaluations. This finding aligns with processing fluency theory. Additionally, we demonstrate that the degree of processing from raw to end materials and the extent to which materials fulfil product functions mediate the effect of repurposed materials on perceived incongruity.

Keywords: schema congruity theory, product evaluation, new product development, repurposed materials

2.1 Introduction

The success of a new product can depend on the degree to which consumers perceive the product to be incongruent with their expectations. The well-known "MAYA" (Most Advanced, Yet Acceptable) principle from Raymond Loewy (1950s) suggests that an inverted U shape relation exists between product incongruity and product evaluations: consumers can easily get bored with new products that are congruent with their expectations, but they can also reject products that are too incongruent with their expectations. Therefore, consumers would mostly prefer new products that are moderately incongruent. This inverted U shape relation between perceived incongruity and product evaluation has been explained by schema congruity theory (Mandler, 1982), and over the years many studies have supported the idea of an inverted U shape relation between product incongruity and product evaluation (Campbell & Goodstein, 2001; Jhang et al., 2012; Maoz & Tybout, 2002; Meyers-Levy & Tybout, 1989; Noseworthy et al., 2014).

However, these existing studies have almost exclusively examined this inverted U shape relation at an average level across consumers by comparing three categories of product incongruity: congruent products, moderately incongruent products, and extremely incongruent products. Even though schema congruity theory predicts the inverted U shape to occur at an individual consumer level, because of the group average based approach to date, it has not been directly examined whether the inverted U shape relationship between incongruity perceptions and product evaluations actually occurs at the individual level. The knowledge gap in investigating the effect of perceived incongruity on product evaluation at the individual level leads, in our view, to a lack of precision in understanding schema congruity theory.

The current research is the first to examine the effect of perceived incongruity on product evaluation at an individual consumer level in a new retailing context. Currently, increasingly many retailers introduce new products with natural, repurposed materials as alternatives for sustainability considerations. Such "repurposing" concerns the change of using products or materials for their conventional use to using products or materials for a new use (Bridgens et al., 2018; Kamleitner et al., 2019). In most cases, conventional materials are replaced by natural or more sustainable materials, such as repurposed pineapple leaves as alternative to leather, or plastic bottles as raw material for T-shirt fabrics. Repurposed materials may be discrepant from consumers' existing product schemas, and may thereby generate perceived incongruity. Our research examines whether different conventional and repurposed materials evoke various degrees of perceived incongruity and examines the reasons why these materials evoke incongruity perceptions. By studying the relation between incongruity perceptions and evaluations of products with different materials, our findings may also aid retailers to adjust their selections of products with different repurposed materials, and thereby to positively affect the path that leads to increased sales and sustainability.

2.2 Theoretical framework and hypotheses

Consumer researchers have been studying the relation between incongruity in products and product evaluations mostly in retail contexts (Ketron & Spears, 2020; Mitchell & Balabanis, 2021; Taylor & Noseworthy, 2020). Incongruity of a product can be defined as the degree of perceived discrepancy between that product and an activated schema in a consumer's mind (Meyers-Levy & Tybout, 1989). A schema is a stored framework that contains information about product categories, such as product attributes and their links with each other, and prototypic exemplars (Fiske & Linville, 1980).

Schema congruity theory predicts an inverted U shape relation between perceived incongruity and product evaluation: moving from products that are perceived as congruent to products that are perceived as incongruent, consumer evaluations first increase and then decrease (Mandler, 1982; Meyers-Levy & Tybout, 1989). Specifically, when consumers perceive the product to be congruent with their schema, consumers evaluate the product mildly positive, because consumers like their expectations to be confirmed. Incongruent products are more noteworthy than congruent products, and thus evoke more cognitive elaboration (Peracchio & Tybout, 1996). Successfully resolving such incongruity can lead to positive affect, such as curiosity and interest (Berlyne, 1966; Mandler, 1982; Noseworthy et al., 2014). However, when consumers perceive too much incongruity in products, understanding the product can be elusive to consumers, even after deliberation (Mandler, 1982; Peracchio & Tybout, 1996). Such resolution failure can lead to negative affect, such as anxiety and frustration. These affective states can subsequently be contributed to the product evaluation (Mandler, 1982; Meyers-Levy & Tybout, 1989; Noseworthy et al., 2014). For example, (Jhang et al., 2012) used three types of drinks to represent the incongruity levels: vitamin-fortified orange juice (highly congruent), vitamin-fortified coffee (moderately incongruent), and vitamin-fortified vodka (highly incongruent). The authors argued that vitamin-fortified juice confirmed consumer expectations, thereby leading to mildly positive product evaluations. Consumers were able to resolve the incongruity in vitamin-fortified coffee, leading to an even more positive evaluation. Finally, consumers were not able to make sense of vitamin-fortified vodka, thereby leading to lower product evaluations (see Figure 2.1).

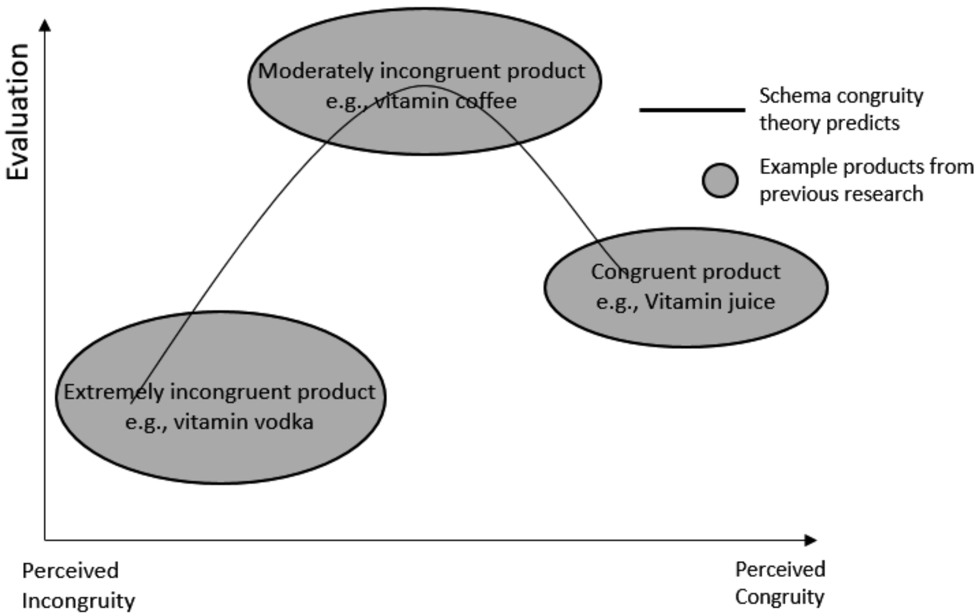


Figure 2.1 Difference between the theory prediction and findings of previous research

As in the research of Jhang et al. (2012), the commonly adopted approach to examine the inverted U shape is to first select products that represent the three categories of incongruity (congruent, moderately incongruent, and extremely incongruent; the three grey areas in Figure 2.1), and then to conduct between-subjects experiments to compare the average evaluations of these products across consumers (Maoz & Tybout, 2002; Meyers-Levy et al., 1994; Meyers-Levy & Tybout, 1989; Noseworthy & Trudel, 2011). In our view, this approach has three disadvantages. First, schema congruity theory posits that it is consumers' incongruity perceptions, and not the incongruity itself, that affects product evaluation. These incongruity perceptions can vary from completely congruent to completely incongruent, resulting in a continuous variable that causes the inverted U shape in product evaluations (the line in Figure 2.1). The existing approach to date has only used three categories of stimuli, and within each category incongruity is assumed to be equal for all participants (the grey areas in Figure 2.1). Then the evaluations of these three groups of incongruity are compared, leading to conclusions about the incongruity and product evaluation of these three groups.

Second, the precise level of incongruity that maximizes product evaluation (the top of the inverted U shape) cannot be estimated when using the pre-determined moderately incongruent products. A more precise estimation of the 'optimal' level of incongruity would increase the precision of the theory's prediction, which might also help product designers to decide how much "advanced" design can be put into the product.

Finally, the theory predicts the inverted U shape to occur within individual consumers. However, the between-subjects approach makes it impossible to learn how changes in incongruity perceptions affect changes in product evaluations for individual consumers. In a between-subjects design, each consumer evaluates only one product. Instead, the use of within-subjects designs would make it possible to examine whether the inverted U shape also occurs within individual consumers. In such a within-subjects design, each consumer evaluates multiple products. This would also make it possible to study individual differences and to identify potential subgroups who are sensitive to the effects of perceived incongruity on product evaluation. Identifying subgroups is particularly relevant when the entire sample presents a null effect. Null effects can be caused by either (1) the absence of an effect in the population, or by (2) the existence of opposite effects in different subgroups, which balance each other out (Miller & Schwarz, 2017). It is, therefore, theoretically valuable to determine whether the effect of incongruity perceptions on product evaluations exists at the individual level. Moreover, the existence of subgroups of consumers may aid retailers to target consumer subgroups. By adopting continuous incongruity perception measures and within-subjects designs, the present research aims to advance the understanding of schema congruity theory. We first aimed to replicate the schema congruity hypothesis concerning the inverted U shape at the average level (i.e., across all consumers):

> *H1: There is an inverted U shape relation between perceived incongruity and product evaluation on average across all consumers.*

After establishing the average effect for perceived incongruity on product evaluations, we aimed to explore whether the effect would also occur at an individual consumer level by clustering consumers into subgroups.

To induce incongruity perceptions in a realistic marketing setting, we selected products made from repurposed and from conventional materials. We expected that repurposed materials would have a stronger mismatch with consumers' product category schemas, and thus would induce more incongruity perceptions than conventional materials. Repurposed materials can be either natural (e.g., pineapple leaves) or artificial (e.g., plastic bottles), which might also influence incongruity perceptions. Therefore, we added naturalness as another dimension in materials to explore the effect of naturalness and the interaction between repurposing and naturalness on perceived incongruity. Thus:

> *H2: Repurposed materials are perceived as less congruent than conventional materials.*

Two reasons why repurposed materials could be perceived as less congruent than conventional materials were examined. One reason could be that consumers perceive repurposed materials as failing to serve the products' primary function. For example, consumers may wonder whether pineapple leaves would be sturdy enough to be materials of backpacks. The function of an object is crucial for people to determine which category the object belongs to (Malt & Johnson, 1992).

Previous research suggests that when being confronted with new products, consumers' priority is to understand the function(s) of the products (Kivetz & Simonson, 2002; Noseworthy & Trudel, 2011). Thus, when materials are perceived to fail the product function, consumers may consider the product to be less congruent. Second, repurposed materials or products often undergo substantial transformations to be suitable for new use (Wilson, 2016; Winterich et al., 2019). For example, the "cottonizing" of bamboo is required for the creation of soft fabrics. We argue that the more steps required in the transformation process to change raw materials into final materials will, the less congruity consumers perceive. Therefore, we hypothesized:

H3a: Lower perceived congruity of repurposed compared to conventional materials is caused by lower product function perceptions of materials.

H3b: Lower perceived congruity of repurposed compared to conventional materials is caused by more perceived processing steps that raw materials need for being transferred to final materials.

We pre-registered the planned sample sizes, analyses, and hypotheses of all studies. The link can be found in the section Pre-registrations and data open access at the end of this book.

2.3 Study 1

Study 1 examined whether various materials generated different levels of perceived incongruity, and the relation between perceived incongruity and product evaluation. This was tested in two studies (1a and 1b) that only differed in the type of products used (Table 2.1).

2.3.1 Method

Participants and Design. The studies had 2 (Naturalness: natural vs. artificial) × 2 (Repurpose: repurposed vs. conventional) within-subjects designs. For each condition, we included two products made by two materials. Each participant was presented with eight products made from eight materials in a random order. The product-material combinations were selected through a Latin-square randomisation from 64 unique product-material combinations.

The current research operationalized perceived incongruity as a continuous predictor. Previous research operationalized incongruity as a categorical predictor (Maoz and Tybout, 2002; Meyers-Levy and Tybout, 1989; Noseworthy and Trudel, 2011). Therefore, the effect sizes from previous studies could not be used to calculate the required sample sizes for the current research. To ensure that each of 64 product-material combinations had at least 20 responses, we planned to collect 160 (20×8) participants. We eventually collected 165 participants for study 1a (M_{age} = 33.8, SD_{age} = 9.3, 66% female), and 161 participants for study 1b (M_{age} = 33.7, SD_{age} = 10.5, 71% female). Participants in both studies were UK residents recruited from the online platform Prolific for monetary compensation.

Products. The backpack (1a) and shoe (1b) pictures were selected based on two criteria: (1) the products were aesthetically non-unique; (2) the materials used for the products were vague to identify (See all product pictures in Figure A in Appendix A).

Materials. Twenty-two materials were pretested on their natural and repurposing levels when being used for backpacks or shoes[1]. The eight materials varying most on the naturalness and repurposing levels were subsequently selected (Table 2.1).

Table 2.1 Products and materials used in all studies

Study	Product	Repurposed Natural Material	Repurposed Artificial Material	Conventional Natural Material	Conventional Artificial Material
1, 2	Backpacks (1a,2); shoes(1b)	Pineapple Leaves; Mushroom	Plastic Bottles; Seat belts	Cotton; Leather	Suede; Nylon
3a, 3b	t-shirts	Seaweed; Nettle	Plastic Bottles; Parachutes	Linen; Silk (3a); Cotton (3b)	Polyester; Nylon

[1] The results of the two pre-tests (1a, 3a) are available on "pretest data and results" section via the OSF link in the section Pre-registrations and data open access at the end of this book.

Procedure and measurements. The studies were implemented through the online experiment platform Gorilla (https://gorilla.sc/). First, participants evaluated each of the eight backpacks (1a)/shoes (1b) without information about the product materials on a single liking rating item adapted from Güçlütürk et al. (2016). Then participants evaluated how much they liked each of eight materials being used for backpacks (1a)/shoes (1b) on the same item. Participants subsequently were again shown each product picture, but this time each picture was accompanied by a text description of the material (e.g., "This backpack is made of pineapple leaves"). For each product with the material description, participants first assessed perceived incongruity of the material used for the product by answering the item "how typical/usual do you think e.g., pineapple leaves are used as material for this backpack?". This item was adapted from a two-item scale for incongruity (Jhang et al., 2012). Finally, participants again evaluated on the single-item measure how much they liked each product with the material description. All items were rated on a 100-point measure, ranging from 1 (not at all) to 100 (very much), with a starting point of 50.

2.3.2 Analyses

The effect of repurpose and naturalness on perceived incongruity was examined with multilevel linear regressions in a Bayesian framework using the R-*brms* package (Bürkner, 2017)[2]. Repurposing, naturalness, and the interaction were the predictors, and perceived incongruity was the outcome[3]. Posterior distributions of slope estimations were reported as results. When 95% credible intervals did not include 0, we claimed the corresponding predictor to be statistically meaningful.

The inverted u shape relation between incongruity and evaluation was examined using a two-lines method with Robin Hood algorithm (Simonsohn, 2018). Compared with the commonly used quadratic regression method, the two-lines method has a higher power and lower false positive rate to detect (inverted) U shape relations. A breakpoint was first identified to separate (in)congruity into two parts along the x-

[2] In the pre-registration, we planned to analyse the multilevel model using the R-lme4 package. However, when conducting the maximal random-effects structure in the multilevel model to yield conservative conclusions, our model failed to converge. To avoid this issue and to keep our model consistent throughout the five studies, we conducted multilevel model in Bayesian framework.

[3] All specific models are available via DANS link in the section Pre-registration and data open access.

axis, ranging from low congruity to high congruity: low congruity on the left side and high congruity on the right side, according to its linear regression on product evaluation. We claimed the inverted U shape to be present at the average level across all participants when the left slope was positive, and when the right slope was negative. The Robin Hood algorithm moves observations from the more powerful line to the less powerful one. The two-lines method was conducted with the interrupted multilevel linear regression.

To explore whether subgroups existed, we extracted individual left and right slope values from each individual, then plotted these values as a two-dimension contour map. We conducted k-means cluster analyses on slope values to identify subgroups in which participants might show clear patterns. The number of optimal clusters was determined by the elbow plot and average silhouette; combined with the decision to keep the cluster number consistent across all five studies in this paper if at all reasonable. Combining these criteria resulted in the identification of two clusters in all studies. When the inverted U shape was shown in one cluster, then, within this cluster, the majority of left slopes should be positive and the majority of right slopes should be negative.

2.3.3 Results and discussion

Both studies showed a main effect of repurposing on perceived incongruity: repurposed materials were perceived as being less congruent than conventional materials, $\beta_{1a} = -40.95$, $SE_{1a} = 2.70$, 95%CI [-46.14, -35.46]; $\beta_{1b} = -46.69$, $SE_{1b} = 2.70$, 95%CI [-52.01, -41.47]. There was also a main effect of naturalness on perceived incongruity in Study 1a: natural materials were perceived as being less congruent than artificial materials, $\beta_{1a} = -6.60$, $SE_{1a} = 2.31$, 95%CI [-11.25, -2.15]; but not in 1b, $\beta_{1b} = -1.41$, $SE_{1b} = 2.32$, 95%CI [-5.92, 3.13]. The interaction effect between repurposing and naturalness was found in both studies, $\beta_{1a} = -11.44$, $SE_{1a} = 4.59$, 95%CI [-20.51, -2.17]; $\beta_{1b} = -10.76$, $SE_{1b} = 4.52$, 95%CI [-19.67, -1.95]. Natural repurposed materials were perceived as being the least congruent (Figure 2.2).

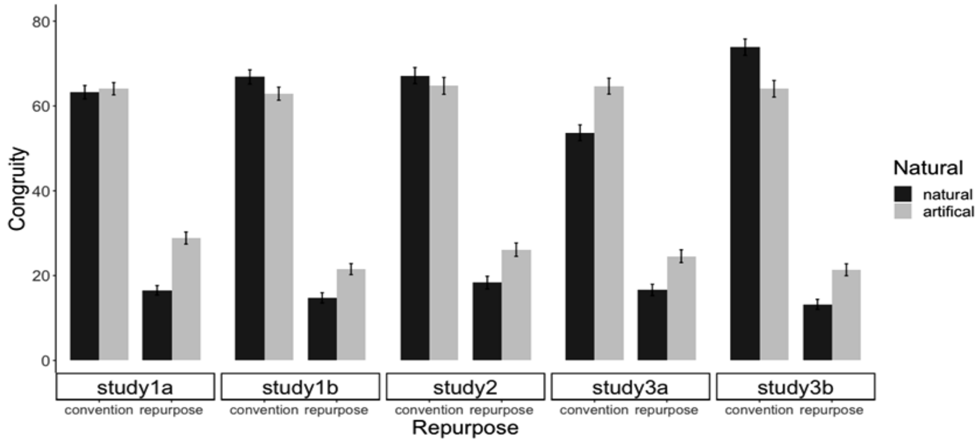


Figure 2.2 The effect of repurposing and naturalness on perceived incongruity for all studies

The interrupted regression generated two slopes (left and right) reflecting how perceived incongruity (from low to high congruity) predicted product evaluation at the average level across all participants. In 1a, the left and right slope were flat across all participants (Table 2.2). At the individual level, cluster analysis showed that cluster 1 (n = 108) had 53% of the left slopes positive and 82% of the right slopes negative; cluster 2 (n = 57) had all left slopes positive and 11% of the right slopes negative (Figure 2.3A). In 1b, the average left and right slopes were flat across all participants (Table 2.2). Cluster 1 (n = 51) had 0% of the left slope positive, and 63% of the right slopes negative; in cluster 2 (n = 110), 70% of the left slopes were positive and 21% of the right slopes were negative (Figure 2.3B, and Table 2.3).

Table 2.2 The average level relation between incongruity and product evaluation from the within-subjects data.

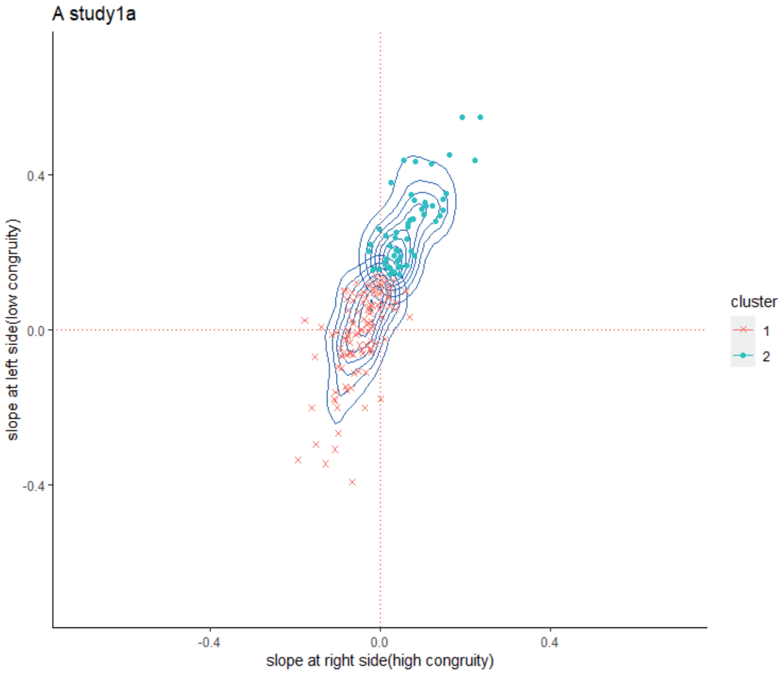
Study	Left slope	SE	95%CI	Centred break point	Right slope	SE	95%CI
1a	0.09	0.05	-0.01, 0.19	8.63	-0.01	0.06	-0.12, 0.12
1b	-0.03	0.08	-0.18, 0.12	-4.13	0.03	0.05	-0.06, 0.12
2	0.11	0.04	0.03, 0.20	7.63	-0.04	0.05	-0.13, 0.05
3a	0.09	0.16	-0.32, 0.41	-15.69	0.20	0.06	0.09, 0.32
3b	0.17	0.08	0.02, 0.33	9.75	0.04	0.09	-0.13, 0.21

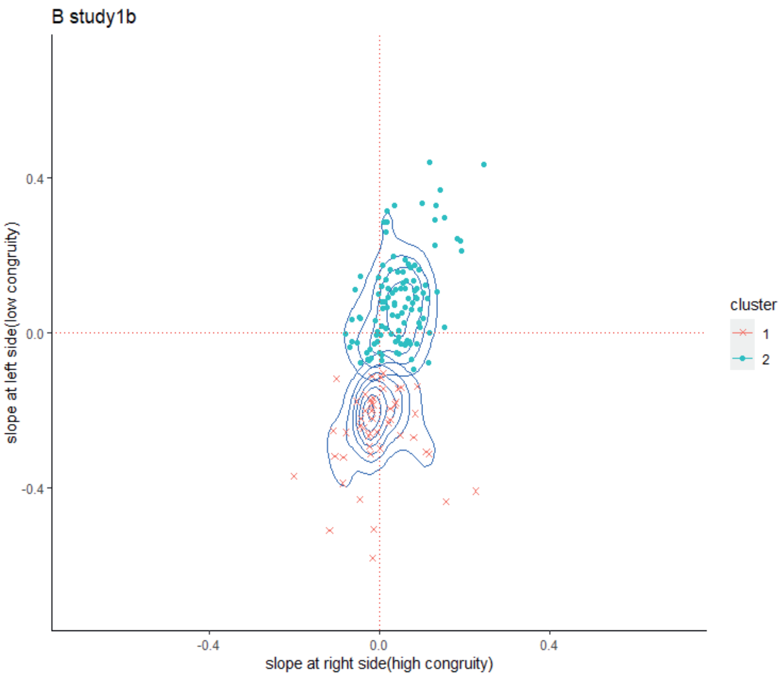
Note: Posterior distribution means, standard errors, and 95% credible intervals of slope coefficients on left and right side of the centred break point are presented.

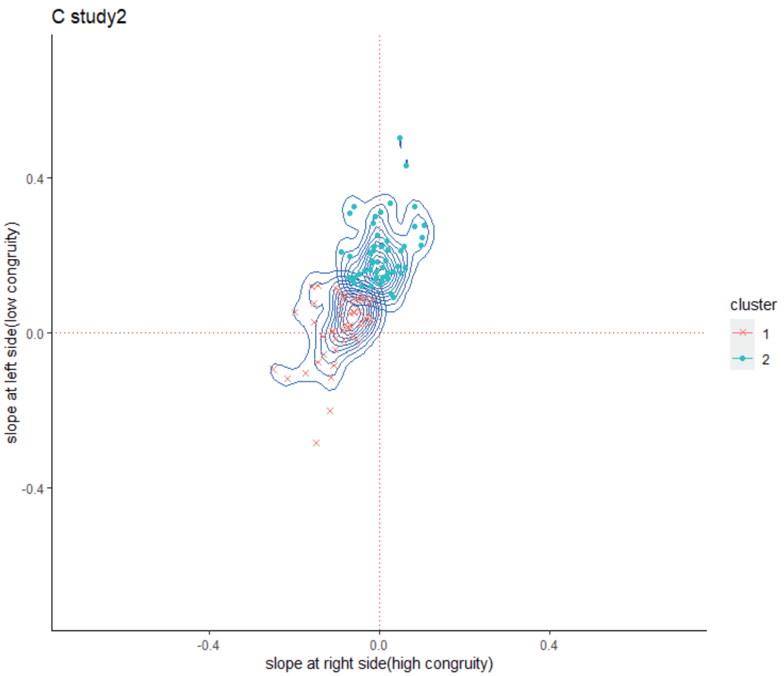
Table 2.3 Cluster analyses on individual slopes.

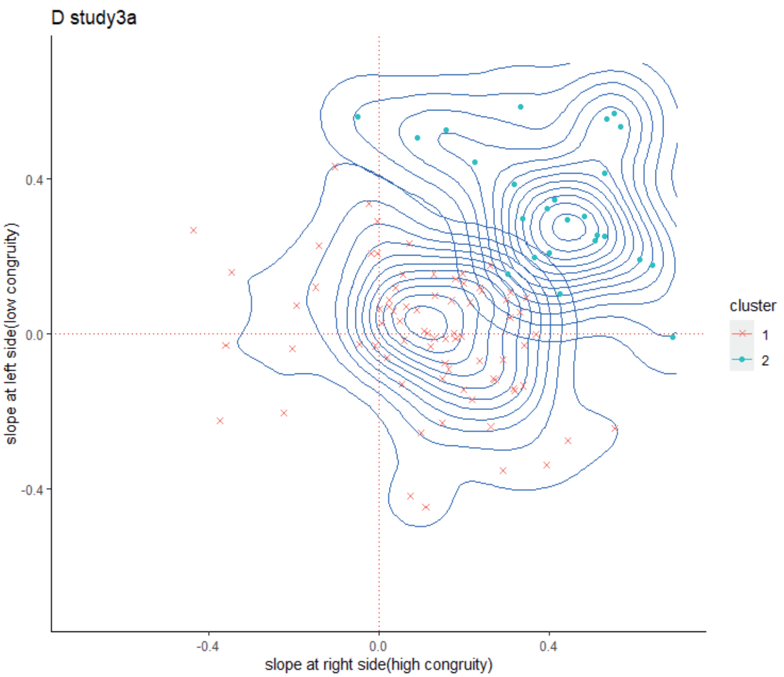
Study	$N_{cluster1}$	Positive left slopes (%)	Negative right slopes (%)	$N_{cluster2}$	Positive left slopes (%)	Negative right slopes (%)
1a	108	53%	82%	57	100%	11%
1b	51	0	63%	110	70%	21%
2	50	70%	100%	53	100%	49%
3a	76	51%	20%	28	96%	4%
3b	53	55%	17%	48	100%	4%

Note: In every study, each cluster’s number of participants, the percentage of participants with positive signs for the left slopes, and the percentage of participants with negative signs for the right slopes are listed.


A study1a
slope at left side(low congruity)
slope at right side(high congruity)
0.4
0.0
-0.4
cluster
1
2


B study1b
slope at left side(low congruity)
slope at right side(high congruity)
0.4
0.0
-0.4
cluster
1
2


C study2
slope at left side(low congruity)
slope at right side(high congruity)
0.4
0.0
-0.4
cluster
1
2


D study3a
slope at left side(low congruity)
slope at right side(high congruity)
0.4
0.0
-0.4
cluster
1
2

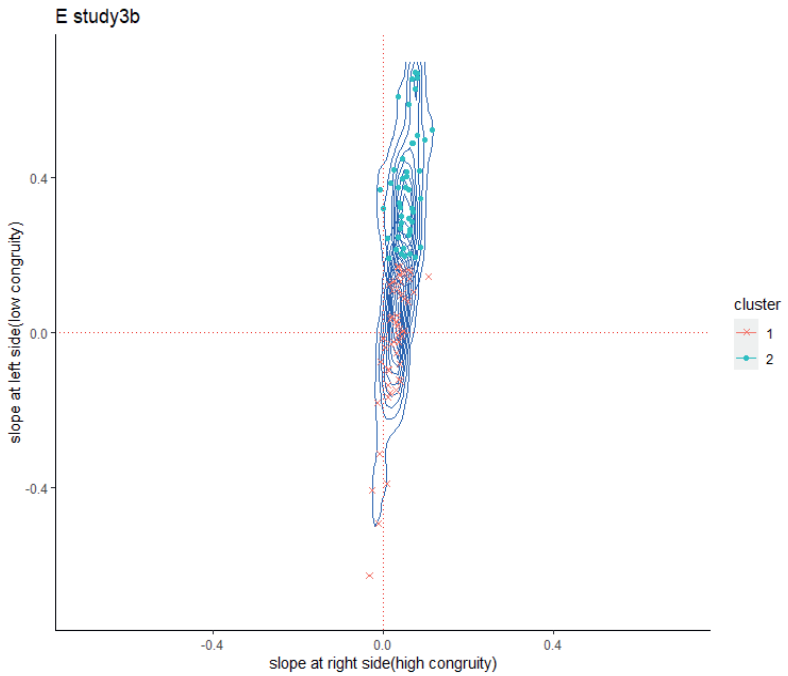


Figure 2.3 The left and right slope distributions in two-dimension maps for all studies

In sum, we found both studies show a main effect of repurposing and an interaction effect between repurposing and naturalness on perceived incongruity. The inverted U shape relation between incongruity perceptions and product evaluations did not appear at the average level across all participants. At the individual level, both studies showed that cluster 2 had the majority of left and right slopes positive. This reflects a monotonic increasing relation: higher perceived congruity predicts higher product evaluation. Before drawing any inferences, these findings should first be replicated.

2.4 Study 2

Study 2 aimed to replicate the results of repurposing and naturalness on perceived incongruity. It also examined the inverted U shape between perceived incongruity and product evaluation with a variation on the dependent variable. Moreover, we explored two potential mediators of the main and interaction effects on perceived incongruity. The procedure and stimuli were identical to Study 1a, except that: (1) participants indicated their willingness to pay for products, instead of product liking; (2) measurements for two mediators were added: perceived product function in materials and processing steps from raw to end materials.

2.4.1 Method

We planned to recruit 100 participants. Eventually 103 were recruited (M_{age} = 36.1, SD_{age} = 11.8, 63% female). Participants indicated their willingness to pay by answering the item "how much are you willing to pay for this bag? Consider the average price of a backpack is £30-£40". The answers were given by moving the slider on a bar ranging from 0-100£, with the default starting point of the slide at 35£. At end of the study, material sturdiness (as a proxy for the function of backpacks) and processing steps were rated for the eight materials. Participants were instructed to drag a slider along the bar (starting point 50) from fragile (1) to sturdy (100) and from few (1) to many steps (100) in a 100-point scale for each material (i.e., "please compare the sturdiness of each material for making backpacks"; "please compare how many steps it takes to process each material for making backpacks").

2.4.2 Results and discussion

Similar to study 1, results showed the main effect of repurposing on perceived incongruity, β = -43.85, SE = 3.20, 95%CI [-50.17, -37.65]. There was also an interaction between repurposing and naturalness, β = -10.10, SE = 4.56, 95%CI [-18.86, -1.02]. There was no main effect of naturalness, β = -2.71, SE = 2.32, 95%CI [-7.28, 1.84]. Natural repurposed materials were perceived as being the least congruent (Figure 2.2).

We conducted two mediation analyses with the mediators processing steps and sturdiness: one for the main effect of repurposing on perceived incongruity, and one for the interaction effect of repurposing and naturalness on perceived incongruity. We applied Baron and Kenny's three-step approach (Baron & Kenny, 1986) adapted to a Bayesian framework. We first regressed the mediators (processing steps and sturdiness) on the independent variable (repurposing condition) to calculate the posterior distribution of the coefficient α (i.e., path a). Second, we regressed the dependent variable (perceived incongruity) on the independent variable (i.e., the total effect). Third, we regressed the dependent variable on both the independent variable and on the mediators to calculate the posterior distribution of the coefficient β (i.e., path b). The mediation effect was calculated by multiplying each α and β sampling from their posterior distributions with 12,000 samples (Yuan & MacKinnon, 2009; X. Zhao et al., 2010). The medians and 95% credible intervals of the indirect effects, the direct effect, and the total effect were reported in Table 2.4. The results showed that the main effect of repurposing on perceived incongruity was partially mediated by processing steps, but not by sturdiness. Thus, the more processing steps were perceived as needed to transform materials, the less congruent participants perceived the materials to be. The interaction effect was neither mediated by processing steps nor by sturdiness.

Table 2.4 Mediators of the main effect of repurposing on congruity**.**

Study	Coefficient posterior distribution	Softness indirect effect	Sturdiness(s2) Durability(s3) indirect effect	Processing steps indirect effect	Direct effect	Total effect
2	Median	-	-2.41	-2.70	-38.59	-43.85
	2.5%	-	-7.34	-6.07	-45.19	-50.17
	97.5%	-	1.95	-0.44	-32.18	-37.65
3a	Median	-2.91	-2.89	-0.31	-31.97	-38.70
	2.5%	-5.69	-7.39	-2.22	-37.22	-44.57
	97.5%	-0.69	1.33	1.06	-26.77	-32.90
3b	Median	-3.25	-1.28	-0.27	-46.60	-51.62
	2.5%	-6.34	-3.88	-2.20	-53.49	-58.15
	97.5%	-1.01	0.95	1.40	-39.58	-44.99

Note: The median, the 2.5th percentile, and the 97.5th percentile of the posterior distribution of each indirect effect, direct effect, and total effect are reported.

The results of testing the inverted U shape between perceived incongruity and product evaluation showed that the average left slope was positive, and the right slope was flat across all participants (Table 2.2). At the individual level, cluster 1 (n = 50) showed that 70% of the left slopes were positive, and that all right slopes were negative; cluster 2 (n = 53) showed that all left slopes were positive, and that 49% of the right slopes were negative (Figure 2.3C, and Table 2.3).

In sum, study 1 and 2 showed a main effect of repurposing and an interaction effect between repurposing and naturalness on perceived incongruity. These findings suggest that using repurposed materials in a product, and especially using natural, repurposed materials in a product, can negatively affect consumers' perceptions of congruity of the product. At the same time, the main effect of naturalness on perceived incongruity varied across studies and was smaller than the other two effects. Therefore, we refrain from interpreting this effect. The main effect of repurposing was partially explained by processing steps, but not by perceived sturdiness of the used materials. In other words, the longer the processing steps from raw to end materials, the less congruent consumers perceived the materials to be.

With the concept of sturdiness, we aimed to examine the role of the perceived function of the product. However, it is possible that consumers did not view sturdiness as an essential backpack function. Therefore, in the next study we pretested consumers' perceptions of the essential functions of the studied products.

Similar to study 1, study 2 did not reveal the inverted U shape between perceived incongruity and product evaluations at the average level across all participants. At the individual level, cluster 2 in study 2 did not replicate the monotonic increasing relation found in study 1. Cluster 1 in study 2 did show an inverted U shape relation in the majority of the slopes. To further examine the robustness of the slope tendencies in the consumer subgroups, study 3 again tested different products and materials.

2.5 Study 3

Study 3 aimed to replicate the mediation of processing steps of the effect of repurposing on perceived incongruity. It also aimed to replicate the subgroup patterns found for the relation between perceived incongruity and product evaluations. Instead of backpacks and shoes used in study 1 and 2, study 3 used T-shirts as products. Two studies (3a and 3b) were conducted, which only differed in one material in the natural, non-repurposed condition (Table 2.1).

2.5.1 Procedure

We recruited 105 participants in 3a (M_{age} = 36.1, SD_{age} = 11.4, 61% female), and 101 in 3b (M_{age} = 35.0, SD_{age} = 11.1, 70% female). The procedure was identical to study 2, except that study 3 used product liking as the dependent measure (similar to study 1). Since study 3 used T-shirts as products, commensurate materials were also changed. A pre-test was conducted to select the essential functions of T-shirts from consumers' perspectives. The four most importantly rated functions were included in study 3: durable, soft, washable, and breathable. A PCA with varimax on these four functions showed that two factors explained 72.68% (3a) and 75.26% (3b) of the variance. Factor 1 consisted of breathability and softness (labelled "softness"). Factor 2 consisted of durability and washability (labelled "durability"). Mediation analyses were conducted by using the average scores of "softness" and of "durability" items as the mediators.

2.5.2 Results and discussions

Again, we found the main effect of repurposing on perceived incongruity in both studies, β_{3a} = -38.70, SE_{3a} = 2.92, 95%CI [-44.57, -32.90], β_{3b} = -51.62, SE_{3b} = 3.34, 95%CI [-58.15, -44.99]. There was a main effect of naturalness in 3a, β_{3a} = -9.38, SE_{3a} = 2.31, 95%CI [-13.97, -4.89], but not in 3b, β_{3b} = 0.81, SE_{3b} = 2.94, 95%CI [-4.94, 6.63]. There was no interaction in 3a, β = 3.05, SE = 4.63, 95%CI [-6.15, 12.08], but there was an interaction in 3b, β_{3b} = -17.81, SE_{3b} = 6.30, 95%CI [-29.96, -5.50] (Figure 2.2). Since the only difference between 3a and 3b was one material changing from silk (3a) to cotton (3b) in the conventional-natural condition, we speculated that the presence and absence of the naturalness main effect and of the interaction were sensitive to material selections. Therefore, we did not further analyse or explain these two effects, nor conducted related mediation analyses on these effects.

Mediation analysis was conducted on the main effect of repurposing on perceived incongruity. Softness, durability, and processing steps were included as mediators. We followed the same procedure as in study 2. The results showed that softness mediated the main effect of repurposing on perceived incongruity in studies 3a and 3b: the less a material was perceived as soft, the less congruent participants perceived the material to be. Processing steps and durability did not mediate the main effect of repurposing on perceived incongruity in 3a nor 3b (Table 2.4).

The two-lines method again examined how perceived incongruity predicted product evaluation at the average level across all participants. In 3a, the average left slope was flat, and the right slope was positive (Table 2.2). At the individual level, cluster 1 (n = 77) showed that 51% of the left slopes were positive, and 20% of the right slopes were negative; cluster 2 (n = 28) showed that 96% of the left slopes were positive and 4% of the right slopes were negative (Figure 2.3D). In 3b, the average left slope across all participants was positive and the right slope was flat (Table 2.2). Cluster 1 (n = 53) showed that 55% of the left slopes were positive, and 17% of the right slopes were negative; cluster 2 (n =48) showed that all left slopes were positive, and that 4% of the right slopes were negative (Figure 2.3E, and Table 2.3). In both 3a and 3b, we found the monotonic increasing relation in cluster 2.

Study 3 again confirmed the effect of repurposing on perceived incongruity and revealed that this effect was mediated by product function softness in T-shirts. The inverted U shape relation between incongruity perceptions and product evaluation did not appear at the average level across all participants. At the individual level, both studies (3a and 3b) showed that cluster 2 had most left and right slopes positive. This reflects a monotonic increasing relation: higher perceived congruity leads to higher product evaluation, similar to study 1.

2.6 General discussion

To provide more precise evidence for schema congruity theory, the current research applied a new approach to identify the inverted U shape relation between perceived incongruity and product evaluation. We examined whether incongruity perceptions, instead of groups of products with pre-determined incongruity, relate to product evaluations for individual consumers. The current findings do not support schema congruity theory. None of our studies showed the inverted U shape relation between perceived incongruity and product evaluation. Our findings do consistently show a subgroup of consumers for which higher perceived congruity leads to higher product evaluations.

Besides presenting a new way to examine schema congruity theory, we also investigated whether using repurposed materials in products can generate incongruity perceptions compared to using conventional materials. Moreover, we examined the reasons why consumers would perceive repurposed materials as incongruent. In line with our predictions, the findings revealed that consumers perceive repurposed materials to be more incongruent than conventional materials. Consumers tend to perceive repurposed materials as more incongruent, because more processing steps are perceived to be required to integrate the repurposed materials in the product (study 2), and because such products are perceived as being less able to fulfil the main function of the product (study 3).

2.6.1 Theoretical implications

Before drawing theoretical implications from not replicating the inverted U shape relation between perceived incongruity and product evaluation found in previous research, we first reflect on two methodological alternative explanations for this null effect.

A first alternative explanation can be that the null effect at the average level across all participants is caused by the within-subjects design. In a within-subjects design, every participant assesses multiple products. Consequently, the perceived incongruity of one product may have influenced the perceived incongruity level of the next product. Although we have limited this influence by counterbalancing the presentation order of the products, it is possible that perceived incongruity of one product may have been influenced by a series of prior congruent and incongruent products. To exclude this alternative explanation, we analyzed the response to the first presented product for every participant. This data approximates a between-subjects design in which participants would see only one (in)congruent product. We found no evidence in any of our five studies for a relation between incongruity perceptions and product evaluations for the first presented products (see Table B in Appendix B). There are thus no indications for the alternative explanation that the within-subjects design has caused the null effect at the average level across participants.

The second explanation for the non-replication of the inverted U shape can be that the current products did not induce enough variance in incongruity perceptions to test the inverted U shape relation between incongruity perceptions and product evaluations. To examine whether this explanation is sound, we plotted the distribution of (in)congruity perceptions across the five studies, and found that centred perception in all studies covered the complete range, from low congruent to high congruent (Figure C in Appendix C). This additional analysis shows that the null effect at the average level across participants was unlikely to be caused by a low variance in perceived (in)congruity. Without any evidence for these two methodological alternative explanations, we continue to interpret the theoretical implications of our findings.

According to schema congruity theory, resolving the puzzle of moderate levels of incongruity would lead to positive affect, and would therefore lead to positive product evaluations. Instead, our finding reveals that at least one subgroup of consumers (cluster 2 in 4 out of 5 studies) consistently evaluates congruent products as more positive than incongruent products. Such a preference for congruent products over incongruent products is in line with processing fluency theory (Reber et al., 2004). In general, congruent products are easier for consumers to process than incongruent products (van Rompay & Pruyn, 2011). Processing fluency theory suggests that processing fluency is a positive experience (Pleyers, 2021; Septianto et al., 2020). Consequently, products that generate more processing fluency, such as congruent products, would generate a more positive experience, and subsequently more positive evaluations, compared to products that generate less processing fluency (e.g., incongruent products).

A dual-process perspective could reconcile the contradictory predictions of schema congruity theory and processing fluency theory (Graf & Landwehr, 2015). Dual process theories suggest that consumers process stimuli either in a more deliberative, controlled way, or in a more rapid, automatic way (Evans, 2008;

Gawronski & Creighton, 2013). It is possible that when consumers process products in a more deliberate, controlled way, the inverted U shape relation occurs. In these instances, solving the puzzle of moderately incongruent products would lead to positive affect, and the failure to solve the puzzle for extremely incongruent products would lead to frustration (Mandler, 1982; Meyers-Levy & Tybout, 1989; Peracchio & Tybout, 1996). Instead, when products are processed in a more automatic way, less processing effort and more processing fluency may lead to higher evaluations for congruent products. This would be in line with the prediction of processing fluency theory (Graf & Landwehr, 2015). The dual-process explanation is supported by the finding that a high motivation to engage in elaboration of brand extensions leads to higher evaluations of moderately incongruent products compared to lower motivation, and consumers with a lower motivation have also been found to evaluate congruent products more positively compared to consumers with a higher motivation (Maoz & Tybout, 2002). In addition, personality traits such as the need for cognition (Cacioppo & Petty, 1982), or openness to change in the context of incongruity (Meyers-Levy & Tybout, 1989), may explain why this monotonic relation was found for subgroups of consumers in our studies. These findings substantiate our approach to consider differences between individual consumers, and to focus on subgroups of consumers, when analysing their responses to products.

2.6.2 Managerial implications

Our research reveals that, for some consumer groups, higher congruity perceptions lead to higher product evaluations. Our research also reveals that repurposed materials in products tend to be perceived as less congruent than conventional materials. These two findings together imply that at least some consumers prefer products made from conventional materials over products made from repurposed, incongruently perceived materials[4]. It is valuable for producers and retailers to find out how to increase congruity perceptions of the products made from repurposed

[4] We conducted pairwise t tests to compare the evaluation between products made from repurposed materials and products made from conventional materials for cluster 2 in each study. The results indicate significantly higher evaluations for products made from conventional materials for cluster 2 in every study.

materials. Our suggestions are derived from the two mediators in our research that partially explain why repurposed materials lead to incongruity perceptions.

First, producers and retailers may provide information on the transformation process of repurposed materials to show that repurposed materials may not need as many processing steps as consumers may think. The findings of study 2 show that repurposed materials are perceived as needing more processing steps to be useable for the product compared to conventional materials, and this perception results in lower congruity perceptions for repurposed materials. In line with this suggestion, previous research has shown that narrative thoughts about the transformation process from the product's original purpose to its repurposed end form enables consumers to feel a special and positive connection with the product (Kamleitner et al., 2019). This, in turn, increases product demand. Thus, providing the story of the 'processing journey' from the original material to the repurposed form may increase consumers' understanding, and thereby increase consumers' congruity perceptions, of products made from repurposed materials.

Second, producers and retailers may increase consumer congruity perceptions and product evaluations for products made from repurposed materials by justifying the functional quality of the product. This suggestion is based on our finding that repurposed materials are perceived as being less able to fulfil the product functions compared to conventional materials (e.g., lower perceived softness as T-shirt materials), which, in turn, leads to lower congruity perceptions. Previous research has indicated that consumers tend to consider basic product functions before other features, such as hedonic benefits, when being confronted with new products (Kivetz & Simonson, 2002; Noseworthy & Trudel, 2011). Once products fail to meet consumers' minimum requirements for the function, consumers are less likely to choose the product (Chitturi et al., 2007, 2008). Therefore, it seems essential that producers and retailers focus on the function of products made from repurposed materials, convincing consumers that such products do meet consumers' minimum function requirements.

2.6.3 Limitations and future research

Some of our theoretical and managerial implications give rise to questions for future research. For example, we recommend future research to reconcile the contradictory predictions between schema congruity theory and processing fluency theory, and to identify personality moderators that can explain the differences between the identified subgroups which show different relations between perceived incongruity and product evaluation. In addition, for practical application it would be useful to identify which product properties or narratives can be used to increase congruity perceptions of products made from repurposed materials.

It may be possible that our findings have been affected by our use of single-item measures for perceived incongruity and for product evaluation. When using within-subjects designs, it is essential for the quality of the research to avoid participant fatigue and dropouts. Therefore, we measured perceived incongruity with a single item derived from the incongruity manipulation check (Jhang et al., 2012). Similarly, we measured product evaluation with single-item measures that have also been commonly adopted in previous research (Güçlütürk et al., 2016; Kamleitner et al., 2019; Magnier et al., 2019). Indeed, measuring concepts with single-item measures is equally valid to measuring concepts with multiple-item measures that measure the concepts with synonyms (Bergkvist & Rossiter, 2007). Yet, it may be possible that these measures for perceived incongruity and for product evaluations do not capture all relevant dimensions of these concepts. Especially for the concept of perceived incongruity, it is currently unclear whether this concept consists of multiple dimensions. Future research is therefore recommended to validate the current results using multiple-item measures, and to explore the existence of different dimensions of incongruity to gain a better understanding of the concept of incongruity product perceptions.

2.6.4 Conclusion

In conclusion, the current research investigated the relation between perceived incongruity and product evaluation, and how material repurposing and naturalness can generate incongruity perceptions. It appears that at least some consumers look more favourably towards products that are perceived as more congruent. It also appears that consumers' incongruity perceptions of products depend on the materials of the product: when repurposed materials are used in products, consumers perceive the products to be less congruent. The more steps are necessary to repurpose the materials, and the more consumers doubt whether such materials fulfil the function of the product, the less they perceive the product to be congruent. Such incongruity perceptions negatively affect product evaluations, leading to lower chances of success for these products. For a move towards a more sustainable future, it may thus be valuable for scholars and producers alike to find ways to improve consumers' perceptions of the functional quality and processing mechanisms of products made from repurposed materials.

Chapter 3
Typical atypicalities: An exploratory study on factors predicting atypicality in new products and their associations with consumer responses

This chapter is based on Gao, X., De Hooge, I. E., & Fischer, A.R.H. Typical atypicalities: an exploratory study on factors predicting atypicality in new products and their associations with consumer responses. (to be submitted for publication)

Abstract

Successfully launching new products on the market can be a challenge for companies. One of the factors predicting the success of new products is how atypical consumers perceive a new product to be. Existing studies in separate research domains have shown how individual factors can predict atypicality perceptions. Yet, no research to date has combined these individual factors to examine whether these are all the predictors for atypicality or whether there are more reasons underlying consumer perceptions of atypicality. With an exploratory, qualitative method, the current research examines the factors predicting consumers' atypicality perceptions. The findings support the existence of seven factors that were previously identified in existing research, and reveal two new factors predicting atypicality perceptions. Moreover, we explore the relationships between these factors, product information that consumers need, and consumers' emotions. The findings indicate that, only when consumers understand the product benefits, consumers are likely to experience positive emotions towards the product and need more information about its accessibility. Together, the current findings provide a framework that integrates different streams of literature on atypicality and sheds new light on the reasons why consumers perceive products as atypical.

Keywords: atypicality, product incongruity, product innovation, emotions, information search, correspondence analysis

3.1 Introduction

For companies, it is crucial to regularly launch new products to stay competitive in the market. Companies invest extensive resources to develop new products, but up to 40% of the launched new products fail (Castellion & Markham, 2013; Kocina, 2017). To an important extent, consumer responses to the new products depend on how atypical consumers perceive the new products to be. Research indicates that the degree of atypicality can influence various consumer responses, such as consumers' product evaluations and purchase intentions (Chowdhury, 2007; Liu et al., 2020; Scarpi et al., 2019; Spielmann, 2016), consumers' emotional and physical responses (Gerrath & Biraglia, 2021; Noseworthy et al., 2014), and strategies that consumers apply to understand new products (Gregan-Paxton & Moreau, 2003; M. Zhao et al., 2012).

Given that perceived atypicality plays a key role in consumer responses to new products, it is important to understand which factors predict consumers' atypicality perceptions of products. To be able to identify these factors, we define atypicality in products for the purpose of this chapter as the degree of perceived discrepancy between a product and a particular product category (Meyers-Levy & Tybout, 1989). Separate lines of research, each using different terminology for atypicality, have examined factors that can predict atypicality and their effects on consumer responses. For example, research on product innovations has investigated the effect of product newness on product evaluation (Hoeffler, 2003; M. Zhao et al., 2012). In this line of research, product newness depends on whether the product can bring new benefits. For example, 3D cameras ("captures very lifelike 3D photographs") are considered to be more atypical than digital cameras ("a new lens with a higher pixel resolution"), because 3D cameras bring a new benefit which did not exist before (Hoeffler, 2003; Mugge & Dahl, 2013). As another example, research on product incongruity has focused on the mismatch between product features and product categories (Meyers-Levy et al., 1994; Meyers-Levy & Tybout, 1989; Noseworthy et al., 2014). In this line of research, products such as vodka with added vitamins are perceived as more atypical than coffee with added vitamins, because consumers perceive vodka to be more mismatched with vitamins than coffee (Jhang et al., 2012). Although product newness and product incongruity have different meanings, both concepts could thus predict consumers' atypicality perceptions of products.

Even though separate streams of research have identified isolated factors that can predict atypicality, to the best of our knowledge, no research thus far has combined these isolated factors in a comprehensive approach to understanding which factors predict atypicality perceptions. Consequently, it is currently unclear whether the factors identified by different lines of research are similar or distinct, and whether these factors together provide a complete overview of all the possible reasons why consumers may perceived products to be atypical. It may be possible that there are more factors predicting atypicality perceptions, which have thus far been overlooked. The current research aims to identify the existing factors as separate factors, and to explore whether other, new factors can predict atypicality perceptions. It is important to recognize the full range of factors predicting atypicality for two reasons.

First, by integrating separate lines of research into one framework, it is possible to connect literature on product atypicality, product incongruity, and product innovation that have thus far gone unintegrated. Research studying typicality perceptions (Loken & Ward, 1990), product newness (Hoeffler, 2003) and product incongruity (Meyers-Levy & Tybout, 1989) have provided valuable insights into how consumers respond to new products, but these lines of research have not been integrated or built upon each other's work. By integrating these separate research lines into one framework in which distinctive factors predict atypicality perceptions, we provide the first step towards such a coherent understanding of consumer responses to product atypicality. Moreover, such a framework can also include more unknown factors predicting atypicality perception that has not been covered in previous research. Integrating different research lines related to atypicality perception thus will contribute to a more comprehensive understanding of atypicality.

Second, the full range of factors predicting atypicality perception can be further associated with a variety of consumer responses. The current research investigates two types of consumer responses: the product information consumers need and consumers' emotions. The association among the factors predicting atypicality perceptions, product information, and consumers' emotions can be valuable to both scholars and marketers. On a scientific level, the associations between multiple factors, product information, and emotions may shed light on why consumers sometimes search for more information or experience positive emotions towards atypical products, and why, at other times, they do not. Practically, marketers may design marketing strategies for new products to evoke more positive emotions based on the associations between specific factors, product information, and emotions. This may positively affect the chance that a new product will be successful. Together, these findings provide a valuable first step towards integrating different views on atypicality that can assist scholars in understanding atypicality perceptions of new products and marketers in increasing the chance of success of new products.

3.2 Theoretical Background

3.2.1 Factors that predict atypicality perception

Factors predicting *typicality* perceptions may predict *atypicality* perceptions. This is because, to some extent, the concepts of typicality and atypicality can be considered counterparts. Typicality is often defined as the degree to which an item is perceived to represent a category (Loken & Ward, 1990; Rosch & Mervis, 1975). Whereas atypicality emphasizes perceived “discrepancy” with a category, typicality emphasizes perceived “representativeness”. According to Loken and colleagues (1990), the four factors that predict consumers’ typicality perceptions of products are (1) shared and distinctive attributes with other attributes in a product category; (2) consumers’ familiarity with the product; (3) the frequency with which consumers encounter the product; (4) consumers’ attitude towards the product. In the next paragraphs, we explain why and how each factor could also predict atypicality perceptions.

The first factor predicting typicality perceptions is the shared and distinctive attributes of the product. The fewer attributes the product shares with other category members, the less typical for the product category the product is considered to be (Mervis & Rosch, 1981). Also, the more distinctive attributes a product contains that are not shared with other members in the category, the less typical the product is considered to be (Tversky, 1977). Such distinct product attributes may cause consumers to experience difficulty when categorizing products (Ozanne et al., 1992). For example, consumers may experience difficulty when categorizing a low-priced car from a luxurious brand as either a luxurious or economy car, because a “low price” is a distinctive attribute in the luxury car category. In the case of atypicality, consumers may thus perceive products to be atypical when the products have fewer shared attributes with and/or more distinctive attributes from the other category members in the product category.

We introduce the second and third factors together to clarify the subtle boundary between the two related factors. Familiarity refers to whether an object’s meaning is obvious to consumers (Hampton & Gardiner, 1983). The less obvious a meaning is to consumers, the less typical consumers perceive the product to be (Malt & Smith, 1982; McCloskey, 1980). Frequency of exposure refers to how frequently consumers encounter the product as an instance of the category (Barsalou, 1985). The less frequently consumers encounter the product, the less typical they perceive the product to be (Barsalou, 1985). Exposure frequency can influence consumers’ familiarity with the product, but exposure frequency to and familiarity with a product can also be unrelated. For example, consumers can be familiar with bamboo T-shirts because they have read an article about these products in magazines. However, if bamboo T-shirts are hardly available in clothing stores, consumers will encounter them less frequently. Therefore, consumers may perceive products to be atypical when consumers are less familiar with the products and/or when consumers encounter the products less frequently.

The fourth factor predicting typicality perceptions is consumers’ attitudes towards products. In general, consumers like typical products (Barsalou, 1985; Loken & Ward, 1990). However, consumers’ attitude towards a product when considering it to be atypical is more complex. Processing fluency theory suggests that typical products are easy to process and thus generate a positive experience for consumers (Pleyers, 2021; Reber et al., 2004). This may lead to a positive attitude towards typical products. Schema congruity theory suggests that atypical products can also evoke a positive experience when consumers successfully resolve incongruity in the product, which may lead to a more positive attitude towards atypical products than towards typical products (Mandler, 1982). However, a failure to resolve incongruity can be a negative experience, leading to a negative attitude towards the product (Meyers-Levy & Tybout, 1989). As both positive and negative attitudes towards products are possible when consumers perceive products to be atypical, both positive and negative attitudes towards products may predict atypicality perceptions as compared to a neutral attitude.

In addition to the four factors that are based on research studying typicality, we propose that factors may also be derived from research studying atypicality. Although related, the difference between the two research lines is non-trivial. Research on typicality mostly examines the factors that distinguish typicality from atypicality (Loken & Ward, 1990). Research on atypicality mostly focuses on the factors that influence the degree of perceived atypicality, such as product newness (Hoeffler, 2003) or product incongruity (Meyers-Levy & Tybout, 1989). We propose that two factors from research on product newness and one factor from research on product incongruity may play a role in predicting atypicality perception in products.

Research on product newness has divided innovative products into two types: really new products and incrementally new products (Hoeffler, 2003; Moreau, Markman, et al., 2001; Mugge & Dahl, 2013). Really new products enable consumers to obtain new benefits or to do new things they have not been able to do previously. Incrementally new products are products that consumers consider to be minor variations on or improvements of existing products (Mugge & Dahl, 2013; Veryzer, 1998). For example, the first generation of the iPhone was a really new product because of its new appearance and functions (MP3, internet communicator). The next generations of iPhones were considered as incrementally new products because they were relatively minor improvements of the first generation. Based on new benefits provided by incrementally and really new products, we infer two factors that may also predict consumers' atypicality perceptions.

The first factor relates to consumers' thoughts about the new benefits of the product. For incrementally new products, consumers perceive the benefits to be highly comparable to those of an exemplar typical for the specific product category (Mugge & Dahl, 2013). As really new products bring benefits that did not exist before (Veryzer, 1998), these new benefits deviate from consumers' existing category knowledge. Thus, consumers might not understand the benefits of really new products (Moreau, Lehmann, et al., 2001). As product typicality largely depends on the functions and benefits in the product category (Malt & Smith, 1982; McCloskey, 1980), consumers' thoughts on product benefits may be a factor predicting consumers' atypicality perceptions.

The second factor relates to the process that consumers need to learn about the benefit of, and about how to use, really new products (Moreau, Lehmann, et al., 2001; Wood & Moreau, 2006). Consumers usually transfer their knowledge from an existing product category to a new product, to try to understand the new product (Hoeffler, 2003; Veryzer, 1998). In the case of really new products, such as the first generation of the iPhone, knowledge transfer might be difficult because consumers need knowledge from multiple categories to understand the really new product (the iPhone) (Moreau, Markman, et al., 2001). For incrementally new products, such as the next generations of iPhones, less knowledge transfer might be required. Therefore, the really new products might be perceived as deviating more from a specific product category compared to incrementally new products. Transferring knowledge from other product categories implies that consumers need to change their knowledge of the existing product category. Thus, we argue that knowledge transfer could be a factor predicting consumers' atypicality perceptions.

Research on product incongruity reveals one other factor that may play a role in consumers' atypicality perceptions, namely an incongruity or mismatch between a product's attributes or features and a product category (Meyers-Levy & Tybout, 1989). Example products are black toilet paper, spicy cake, or vitamin coffee, in which a certain attribute is mismatched with the product category (Meyers-Levy & Tybout, 1989; Noseworthy et al., 2014; Peracchio & Tybout, 1996). The levels of perceived incongruity are differentiated based on the ease with which consumers can resolve this incongruity (Mandler, 1982; Peracchio & Tybout, 1996). Consumers can resolve incongruity by finding a pre-existing association between a product feature and the product category (Jhang et al., 2012). For example, the incongruity between vitamin and coffee can be resolved by identifying the pre-existing association "a good start of the day" that links vitamin and coffee. It is, however, more difficult for consumers to find an association that links vitamin and vodka (Jhang et al., 2012). Associations between product features and the product category that are more difficult to find could indicate more discrepancy between the product feature and the product category, and therefore, more atypicality perceptions of the product. Thus, we argue that incongruity can be a factor predicting consumers' atypicality perceptions.

In sum, we can list four potential factors from research on typicality (shared and distinctive attributes, familiarity, exposure frequency, attitudes towards products) and three potential factors from research on atypicality (benefit/function thinking, knowledge transfer, incongruity) that may predict consumers' atypicality perceptions of (new) products. The current research examines whether these factors indeed arise as factors predicting atypicality perceptions, and whether other, currently unknown factors may arise. We do so by presenting consumers with products that vary in (a)typicality and by examining consumer-generated content where consumers provide specific reasons to explain why they consider a product to be atypical. Moreover, we explore consumers' need to collect more information about such products and their emotional responses and associate them with the factors predicting atypicality perceptions.

3.2.2 Information contents and emotions

Consumers require product-related information when confronted with a new product for making their purchase decision (Wilton & Pessemier, 1981). Research has indicated the effects of specific product-related information contents on consumers' product adoption and market performance (Higgins & Shanklin, 1992; Lee & Colarelli O'Connor, 2003; Talke & Snelders, 2013). However, it is unclear whether the effects of specific information contents such as for high-tech products (Talke & Snelders, 2013) would generalize to other types of products. Studying the association between factors predicting atypicality perceptions and the need for product-related information may provide insights into what information consumers need for new product adoption in general.

Previous research has also demonstrated that the degree of atypicality perceptions may relate to consumer emotions (Noseworthy et al., 2014; Schnurr, 2017; Wood & Moreau, 2006). In the innovation literature, Wood and Moreau (2006) have shown that the process of learning how to use a new product is not emotionally neutral. Consumers can experience strong emotions in the initial use of innovative products. Research on product incongruity has indicated that consumers tend to experience positive emotions, such as curiosity, when they can successfully resolve the incongruity in products (Gerrath & Biraglia, 2021). Consumers may experience negative emotions, such as anxiety, when they cannot resolve product incongruity (Noseworthy et al., 2014). Although emotions evoked by new products have been investigated extensively, it remains unclear whether different factors predicting atypicality perceptions, such as incongruity or knowledge transfer, lead to different emotions. Therefore, the current research also explores whether specific emotions are related to different factors predicting atypicality perception.

3.2.3 Atypicality perceptions of fashion products made from repurposed materials

To further understand fashion products from repurposed materials, the current study also explores what factors can predict atypicality perceptions of fashion products made from repurposed materials, and whether these factors are associated with the need for different information and emotions. We propose two factors that can predict atypicality perceptions of these specific products. The first one is product incongruity. Previous research has shown that repurposed materials can evoke incongruity perceptions of fashion products (Gao et al., 2022). The current study attempts to identify this factor again from consumer-generated content. Another factor could be less exposure frequency. Because of remaining technical issues (e.g., Jones et al., 2021) and the relatively small manufacturing scale, consumers encounter products made from repurposed materials less often in the market, compared to fashion products made from conventional materials. Exploring the factors that predict atypicality perceptions for this specific type of product could provide new perspectives on how consumers perceive this type of product, which may inspire new research directions.

3.3 Methods

3.3.1 Participants

In May 2020, fifty-two participants from the UK were recruited through the online platform Prolific (8 males, two with no reported gender, M_{age} = 29.72, SD = 10.98). To ensure that the answers from participants were of high quality, we selected samples from Prolific's participant pool with an approval rate above 90%. The participants were invited to express their opinions on 15 products and received a small monetary compensation.

3.3.2 Stimuli

Stimuli consisted of 75 products. We used 65 new products: 55 products from internet sources[1] and 10 products from recent studies on incongruity (Gao et al., 2022; Noseworthy et al., 2014). The new products covered six domains: 15 assistance-related products (labelled from a1 to a15, such as advanced hearing aids), 10 wearing products (w1-w10, such as shoes made of plastic bottles), 15 food products (f1-f15, such as pickle chips), 5 sports related products (s1-s5, such as smart boxing gloves), 10 health-related products (h1-h10, such as a smart hairbrush), and 10 entertainment related products (e1-e10, such as ear-free headphones). Ten non-new (t1-t10) products were from the same six domains, for example potato chips (food), smartwatches (health), and wireless headphones (entertainment). Each participant was presented with 15 out of the 75 products. To ensure that each participant saw products from every domain, we created five groups of 15 products, proportional across the domains. See specific products in each group in Table D, Appendix D. Each participant was randomly assigned to one group. To ensure that each product was presented approximately ten times, we collected data from 52 participants.

3.3.3 Procedure and Measures

Each participant was instructed to answer questions about the 15 products presented to them. For every product, a product picture was combined with a short text describing its purpose and features. See all product descriptions in Table E, Appendix E. Participants answered three questions for each product. First, participants indicated their emotional response to the product by answering the question, “what is your first response to this product”. The PrEmo scale (Desmet, 2019) was used, and participants were asked to select one out of 14 cartoon figures (7 positive and 7 negative emotions[2]). Emotional responses were measured first to

[1] The majority of products were selected from https://time.com/collection/best-inventions-2018/ and https://time.com/collection/best-inventions-2019/.

[2] We mistakenly omitted the cartoon figure for the positive emotion admiration and presented the similar cartoon figure for joy twice.

avoid potential cognitive interferences of the subsequent questions. Second, participants indicated whether they thought the product was atypical with the question “is this product unusual to you”. Participants could choose “yes, this product is unusual to me” or “no, this product is usual to me”. We used the words “unusual” and “usual” as these are more frequently used synonyms for (a)typical in English (from Google Books Ngram Viewer). Then participants were asked to write down why they considered the product to be atypical (typical) in an open-ended question “could you please explain why this product is atypical/unusual (typical/usual) to you?”. Consumers’ reasons collected from this question were aggregated as different factors predicting (a)typicality perceptions. Finally, participants were asked to write down the questions they wanted to ask about the product in an open-ended question “are there things that you would like to know more about this product?”. If they did not have questions, they were instructed to type “no”. After answering these questions, participants continued with the next product. After finishing all 15 products, they reported their age and gender and were thanked for their participation.

3.3.4 Coding

Participants’ answers to two open questions (reasons for atypicality and questions about the product) were coded by the author and one of the supervisors. We used bottom-up coding to decrease the influence of factors predicting atypicality recognized from previous research. After several iterations of recoding and discussion, we created the initial codebook. An external coder, who was only provided with the initial codebook and unaware of the aim of the study, subsequently coded participants’ answers to the open questions again. The external coder’s coding was then compared to the authors’. The alignment rate was 65% in the reason coding and 70% in the question coding. Misalignments were discussed and resolved. Based on these discussion, in the question coding, the additional code “feature/function” was added to resolve the intertwined meaning between code “feature” and “function” in some products. For example, material softness in T-shirts can be considered as T-shirt’s function and feature. The original answers from participants, authors’ and the external coder’s coding of the original answers, and the solution to each misalignment are available. The link can be found in the section Pre-registrations and data open access at the end of this book.

The final codebook was consolidated with codes for 21 reasons (Table 3.1) and 11 questions (Table 3.2). By analysing the 21 reasons from the final codebook, we attempted to compare and aggregate these reasons into factors from previous research and factors that were unknown from previous research to predict atypicality perceptions.

Table 3.1 Code book of the open question on reasons.

Code	Meaning	Example (participant number, product number)
Not seen	not seen or heard about product	“I have not heard of shoes being made of this material before.” (39, w8)
Seen	knows or seen or heard of product	“Have seen such things before in workplaces.” (50, t9)
Seen similar	infers product from similar products; sees similar products	“Seen lots of products like this.” (52, t4)
Positive attitude	describes product with positive words; willingness to buy product	“looks interesting, I am into photography so something I would buy.” (32, e6)
Negative attitude	describes product with negative words	“I really would never have any use for anything like this and think it looks quite ridiculous.” (16, a2)
New features	mentions specific new features/aspects	“Resolution increase aspect is novel.” (50, e8)
Doubt realistic	does not believe that product exists	“It seems too good to be true.” (43, a14)
Existing	product is realistic	“It is something that is already created.” (41, f15)
Not understand Mechanism	does not understand how product works	“...don't understand the technology that could make it possible.” (35, h6)

Doubt benefit	benefits are useless or unnecessary; does not understand why products have been made	“no one in their right mind would want to design or eat this.” (2, f4)
Understand benefit	mentions or understands product benefit/function; describes products as useful	“…easy and quick way to get extra vitamins.” (6, f11)
Doubt function	understands product function but thinks it is unreliable or harmful	“I don't believe that a product could give you such information just from brushing your hair.” (37, h9)
Not common	describes product as not common or close words	“It is made out of something unusual.” (41, w10)
Common	describes products as common or close words	“It seems quite normal and not new.” (11, a6)
Not match	product does not fit expectations	“It’s unusual to have a robot-like machine do the folding.” (19, a4)
Fit expectation	product matches expectations; categorizes product into a product category	“It's just the logical evolution of the skateboard.” (33, s4)
Compare	compares product with other products	“similar to transition glasses.” (38, h5)
Not use	does not use or does not have product; is not interested in product or product category	“…have never actually used one.” (34, t4)
Use	has or uses products or similar products	“I have one in my home.” (42, t2)
None	does not give any reason	(24, h6)
Not understand text	does not understand the benefit because of description; needs to see product	“It's the sort of thing I would like to see in person and have a 'hands-on' experience with.” (24, a10)

Table 3.2 Code book of the open question on questions.

Code	Examples (participant number, product number)
No	"No"
Mechanism	"How did you make this?" (17, a7); "How technology works?" (27, s2);"How do they make leather from mushrooms?" (18, w4)
Function	"Can you set the time that it wakes you up?" (48, a12); "Does it slowly decrease the volume of music…?" (19, h3); "Does it keep its vitamins/minerals etc?" (9, f2)
Doubt function	"How secure it is?" (35, t9); "Are any of the ingredients in this product harmful to the human body?" (48, f2); "chance of it leaking?" (9, h1)
Feature	"If the shoe is heavy and comfortable." (28, w7); "How long does it last?" (14, w1); "If they feel like normal material or if they feel like plastic." (11, w8)
Doubt feature	"Ethically made?" (33, w3); "What does the company do with the information?" (42, a1)
Feature/function	"What is the range of the tracker?" (3, w1); "Is it compatible with Alexa" (44, a15); "Can you play with people in different houses?" (10, e7)
Access	"where can I get them?" (40, f3)
Price	"How much does it cost?" (9, a12)
Operation	"How do you project things through it?" (48, e9); "How would you control it?" (11, h8)
Benefit	"Would it mean you had less of a hangover?" (9, f12); "Do they have any more health benefits than normal rice?" (30, f1); "Why is it necessary?" (10, w3)

3.3.5 Data restructuring and correspondence analyses

We conducted correspondence analyses to explore the associations among reasons, questions, and emotions. To conduct correspondence analyses, we restructured the data as three contingency tables: (1) between reasons and questions, (2) between questions and emotions, (3) between reasons and emotions. It is worth noticing that participants gave more than one reason or asked more than one question about products in the open questions. Therefore, we duplicated questions for each reason in each participant under a product. The same operation was conducted between emotions and reasons, and between emotions and questions.

Correspondence analyses showed how specific reason codes, question codes, and emotions were located along the dimensions in the correspondence analysis maps. Associations were reflected by whether reason codes and question codes, reason codes and emotions, and question codes and emotions were located on the same side or quadrant, but not by the closeness between each other on the map (Greenacre, 2017). Once reasons were aggregated into factors predicting atypicality perceptions, the results of correspondence analyses could indicate the associations between factors predicting atypicality perceptions, specific information contents and emotions.

3.4 Results and Discussion

3.4.1 Descriptive Results

We first examined which products were considered to be atypical. The 65 new products appeared 668 times and were considered atypical 439 times (65.7%). The 10 non-new products were presented 99 times and were considered to be atypical 16 times (16.2%). These results indicated that participants considered the assumedly new products mostly to be atypical and the non-new products predominantly to be typical.

3.4.2 Different Reasons Explaining Atypicality in Products

In total, nineteen of the twenty-one reason codes indicated why products were considered (a)typical (Table 3.1). The remaining two codes, “none” and “not understand text", were considered irrelevant. In the following paragraphs, we first present the reasons which could be aggregated into four factors from previous research studying typicality in products (Loken & Ward, 1990). Then we present reasons which could be aggregated into two factors from previous research studying product newness (Hoeffler, 2003) and one factor from previous research studying product incongruity (Meyers-Levy & Tybout, 1989). Last, we present remaining reasons and argue whether they can be combined into factors that have not been identified by previous research.

Factors from research on typicality

The code "new feature" (3.3% of total frequency) represented participants observing new features in products. New features in products are distinctive attributes in the product, which reduce the similarity of the product within the product category and thus reduce typicality (Rosch & Mervis, 1975; Tversky, 1977). "New feature" indicated that the factor *distinctive attribute* predicting atypicality perceptions was recognized by participants.

The codes "not seen", "seen", "seen similar", "use", and "not use" (36.5% of total frequency) reflected how much knowledge participants had about the product. This seems to be in line with whether the product's meaning was obvious to consumers (Hampton & Gardiner, 1983; Malt & Smith, 1982). When participants did not use or never had seen the product before, they were less likely to have knowledge about the product. Thus, "not seen", "seen", "seen similar", "use", and "not use" all together indicated the factor *familiarity* predicting atypicality perceptions.

The codes "not common" and "common" (6.9% of total frequency) resembled how frequent participants encountered the products. Less exposure was reflected by words such as "different than normal" or "weird", and these reasons were coded as "not common". More exposure was reflected by words such as "normal" or "nothing new", and these words were coded as "common". These words were consistent with the finding that exposure frequency was related to atypicality perception (Barsalou, 1985). Thus, "not common" and "common" indicated that *exposure frequency* could be a factor predicting atypicality.

The codes “positive attitude” and “negative attitude” (21.3% of total frequency) showed that participants reported an evaluative statement when being asked to write down why they considered products atypical. The evaluative statements might reflect participants’ attitudes towards products. The results showed that more participants had positive than negative attitudes towards the products, regardless of whether they considered the product to be atypical or typical. Among the products considered atypical, we found positive attitudes and negative attitudes towards the product. Interestingly, participants expressed their attitudes towards products without being asked to do so. This phenomenon indicated that both positive and negative attitudes were related to atypicality perceptions in products, which was different from attitudes towards products perceived to be typical. Previous research showed that positive attitude predicts typicality perceptions in products (Barsalou, 1985; Loken & Ward, 1990). Thus, attitudes towards products, either positive or negative, could be a factor to predict atypicality perceptions.

Factors from research on product newness

The codes “understand benefit”, “doubt benefit”, and “doubt function” (16.6% of total frequency) reflected participants’ thoughts on product benefits and functions. Whether participants were familiar with functions and benefits of new products was related to their atypicality perceptions, which was in line with the finding that perceived functionality failure explained atypicality in products (Malt & Johnson, 1992; Schnurr, 2017). These three codes were summarized into *benefit/function thinking* as a factor predicting atypicality.

The code “compare” (4.6% of total frequency) concerned comparisons between the target product and a reference product. In these cases, the reference product was usually an example from a different product category. For example, one participant compared a machine that pulls moisture from the air to make drinkable water with air dehumidifiers (female, age 30, product a14), and another participant compared seaweed food with beef jerky (female, age 23, product f9). These examples might indicate that once participants successfully categorized the target product by comparing the target product with the product from a different category, they transferred the knowledge from the different category to understand the target product (Gregan-Paxton et al., 2002; Gregan-Paxton & Moreau, 2003). Therefore, the code “compare” corresponded to the factor *knowledge transfer* predicting atypicality perception.

Factors from research on product incongruity

The codes “fit expectation” and “not match” (3.6% of total frequency) reflected whether product features matched the product category. For example, “it is just a small bracelet” (female, age 20, product h4), and "not sure the taste and texture would go together” (female, age 20, product f14). The meaning of “not match” seems opposite to the meaning of “fit expectation”. Together, “not match” and “fit expectation” were in line with the concept of product incongruity, which also emphasizes the mismatch between product features/attributes and a product category (Gerrath & Biraglia, 2021; Jhang et al., 2012; Noseworthy et al., 2014). Thus, we argue that “fit expectation” and “not match” indicated that *incongruity* is likely to be recognized as a factor predicting atypicality perception from consumers’ perspectives.

Newly discovered factors

The findings also revealed reasons that were not, or hardly, presented in previous research. The codes “doubt realistic” and “existing” (3.1% of total frequency) represented whether participants believed the product to be real. Together, “doubt realistic” and “existing” indicated a new factor, *doubt realistic,* that can predict atypicality perceptions. Also, the code “not understand mechanism” (0.9% of total frequency) indicated that participants did not understand how the products worked. The factor *not understand mechanism* was referred to as this code predicting atypicality perception.

In sum, nineteen reason codes reflected why participants considered products to be (a)typical. We summarised nineteen reason codes into nine factors predicting atypicality perceptions. Seven of those nine factors were recognized by previous research, including four factors that were similar to factors derived from research on typicality (Loken & Ward, 1990): *distinctive attributes, familiarity, exposure frequency, attitudes towards products*, two factors that were similar to factors derived from research on product newness (Hoeffler, 2003): *benefit/function thinking, knowledge transfer*, one factor that was similar to the factor derived from product incongruity (Meyers-Levy & Tybout, 1989): *incongruity.* In addition, two new factors were discovered*: doubt realistic* and *not understand mechanism*.

3.4.3 Correspondence Analyses Results

In this section, we present how each combination of two of three elements (reason codes, question codes, and emotions) were located along the dimensions in the correspondence analysis maps. The correspondence analysis between reason codes and question codes reflect how reason codes were located according to question codes. The correspondence analysis between reason codes and emotions reflect how reason codes were located according to emotions. The correspondence analysis between question codes and emotions reflect how question codes were located according to emotions. By having the results of three correspondence analyses, we could then infer how reason, questions and emotions were associated.

Correspondence Analysis Between Reasons and Questions

The correspondence analysis between reasons and questions (Figure 3.1) showed that, on the first dimension, reason codes were located from left to right according to the ratio of the frequency of question codes to the frequency of “no” on each reason code (R^2 = 49.5%). Reason codes with a higher ratio were located more on the left side, indicating that more questions were asked when participants gave these reasons. For example, the reason code “not seen” was located on the left side of the reason code “seen”, indicating that more questions were asked when participants provided the reason “not seen” compared to when participants provided the reason “seen”.

The second dimension (R^2 = 21.9%) distinguished reason codes according to the differentiation between the questions about “benefit” and “access”, which were located at the top and bottom along the vertical dimension. Question codes such as “function” or “doubt function” were close to the “benefit” end, and question codes such as “feature” or “price” were close to the “access” end. This suggests that questions close to “benefit” were related to product functions or benefits, and questions close to “access” were related to product features, price, or accessibility. Reasons indicating that participants might understand the product and its benefits were associated with questions close to “access”, and reasons indicating that participants might not understand the product were associated with questions close to “benefit”.

The correspondence analysis showed that the reasons were distributed according to two aspects of questions. Along the first dimension, participants either asked for product information or did not. Along the second dimension, participants asked for two types of product information: benefit related and access related. Benefits related information included “benefits”, “function”, “doubt function”. Access related information included “operation”, “mechanism”, “doubt feature”, “feature”, “price”, “feature/function”, “access”.

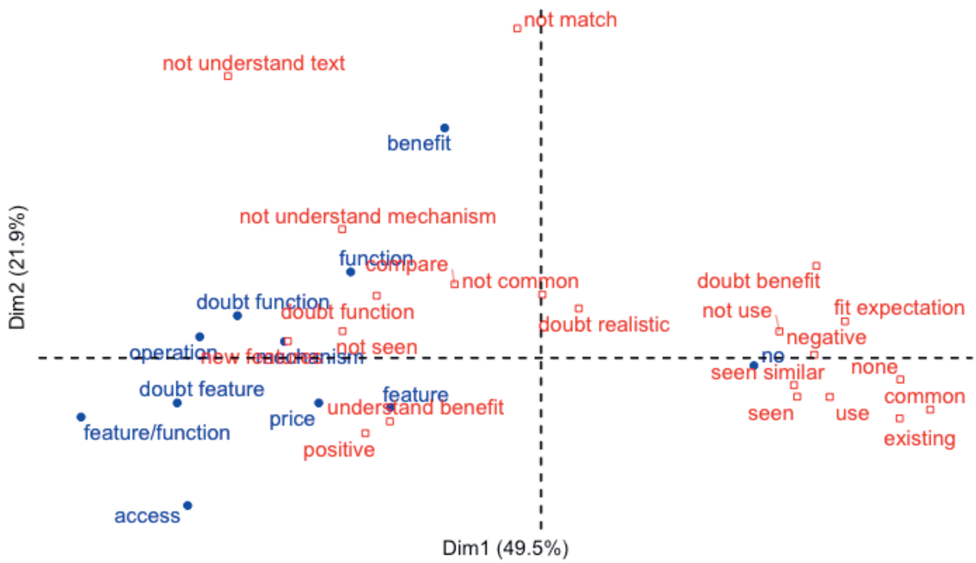


Figure 3.1 Biplot analysis of reasons (rectangle) and questions (circle)

Correspondence Analysis Between Reasons and Emotions

The correspondence analysis between reasons and emotions (Figure 3.2) showed that, on the first dimension, reason codes were located from left to right according to the ratio of the frequency of positive emotions to the frequency of negative emotions (R^2 = 46.4%). Reason codes with a higher ratio were located more on the left side, indicating that participants experienced more positive emotions when giving such reasons. For example, the reason code “understand benefit” was located at the left side of “doubt benefit” was because “understand benefit” had a higher ratio than “doubt benefit”. It reflected that participants experienced more positive emotions when they provided “understand benefit” than “doubt benefit” as a reason.

The second dimension distinguished reason codes according to the differentiation between anger and other emotions (R^2 = 17.5%). Anger and shame were located far from all other emotions, which tended to be closer to the centre of this dimension. However, by further looking at emotion shame, we found that this emotion occurred in total 14 times, and eight of those 14 instances were provided by one participant. Therefore, we did not consider shame as a prevalent emotion for further interpretations. Reason codes “not match”, “not understand mechanism”, and “doubt function” were more associated with emotion anger than other reason codes. Other reason codes were concentrated in the middle along the vertical dimension, and therefore not relevantly distinguishable.

The correspondence analysis showed that the reasons were distributed according to two aspects of emotions. Along the first dimension, participants either experienced positive or negative emotions about the products. Along the second dimension, emotions were divided into two groups: anger at the top and other emotions lumped in the middle.

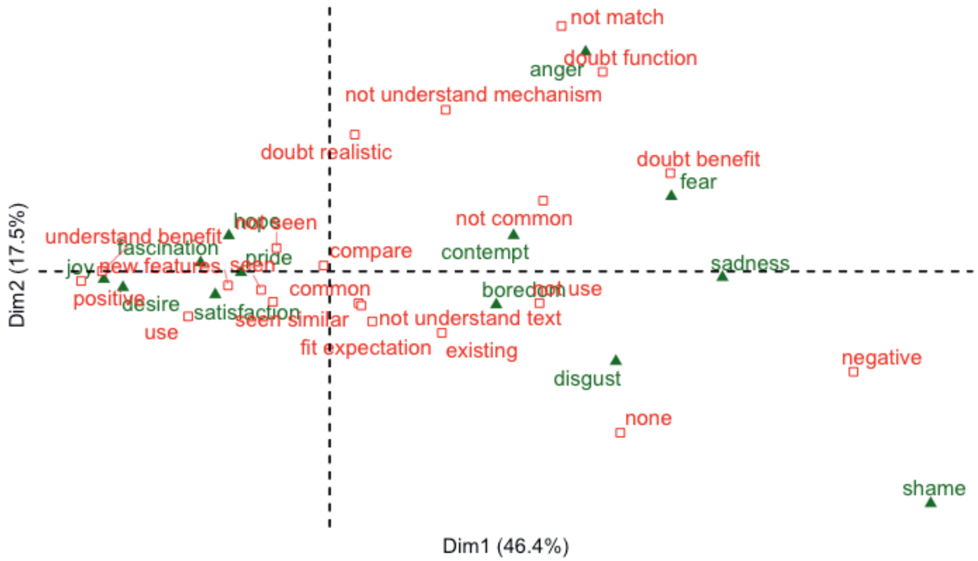


Figure 3.2 Biplot of reasons (rectangle) and emotions (triangle)

Correspondence Analysis Between Questions and Emotions

The correspondence analysis between questions and emotions (Figure 3.3) showed that emotions were located on the first dimension from left to right according to the ratio of the frequency of the code “no” to the frequency of question codes (R^2 = 65.5%). Emotions with a higher ratio were located more on the left side, indicating that fewer questions were asked when participants experienced such an emotion. For example, boredom was located on the left side of fascination, because boredom had a higher ratio. The location of these two emotions indicated that participants asked fewer questions when the negative emotion of boredom was experienced than when the positive emotion of fascination was experienced.

Along the second dimension, question codes were distinguished according to the location of anger and of positive emotions on the right side (R^2 = 11.5%), because on this dimension anger was located far from the emotions on the right side. The distribution of question codes along the vertical dimension was similar to the reasons-questions correspondence analysis in having “benefit” and “access” as the two ends along this dimension. We inferred that the questions close to “benefit”, such as “doubt function” or “doubt feature”, were more associated with anger than the questions close to "access", such as "feature/function" or "operation", which were more associated with positive emotions on the right side.

The correspondence analysis showed that along the first dimension, the distribution of emotions distinguished whether the participants needed product information or not. Participants generally needed more information when they experienced positive emotions and needed less information when they experienced negative emotions. One exception was that participants needed less product information when they experienced satisfaction. Along the second dimension, the distribution of questions differentiated anger from other positive emotions except for satisfaction. When participants needed product information about benefits or doubted product functions, they were more likely to experience anger; when they needed information about product accessibility, they were more likely to experience positive emotions.

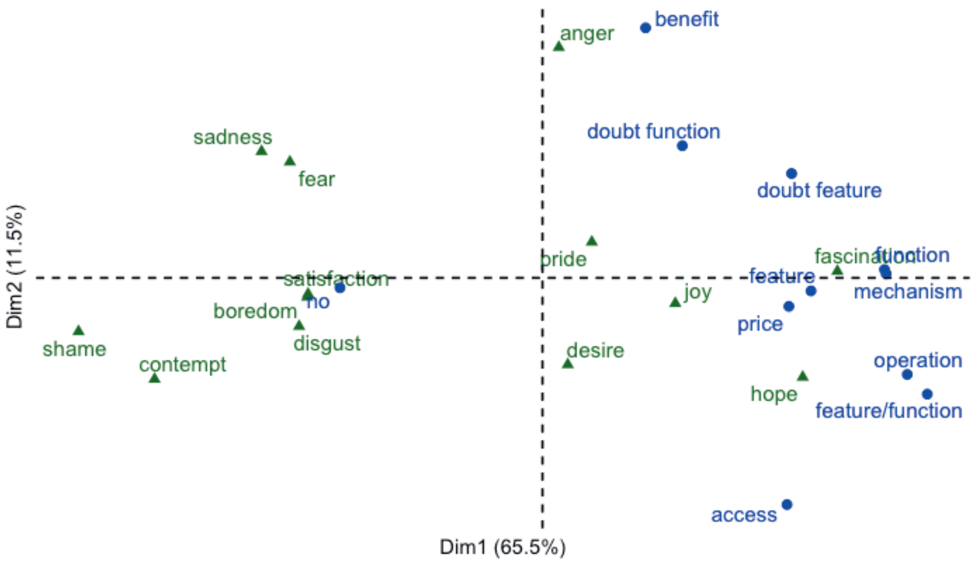


Figure 3.3 Biplot of questions (circle) and emotions (triangle)

3.4.4 The Association Among Reasons, Questions and Emotions

Combining the results of the three correspondence analyses from the previous sections, we summarized the associations among factors predicting atypicality perceptions, questions, emotions (Table 3.3).

The factor *distinctive attributes* was reflected by the reason code “new feature”. “New feature” was neither associated with questions about benefits nor with questions about accessibility, because it was in the middle between questions “benefit” and “access” (Figure 3.1). “New feature” was more likely to be associated with positive emotions (Figure 3.2), which was in line with the finding that products with either unique or enhanced new features were perceived as more favourable than products without new features (Zhou & Nakamoto, 2007). The factor *distinctive attributes* was therefore associated with positive emotions.

The factor *familiarity* included the reason codes “not seen”, “seen”, “seen similar”, “not use”, and “use”. Participants whose reason was “not seen” asked more questions, and participants whose reasons were “seen”, “seen similar”, “not use”, or “use” asked fewer questions (Figure 3.1). While “not seen”, “seen”, “seen similar”, and “use” were located on the side with positive emotions, “not use” was located on the side with negative emotions (Figures 3.2). These findings suggested that participants might be open to collecting more information about the products. As collecting information could be a rewarding activity (Marvin & Shohamy, 2016), participants who asked more questions could experience more positive emotions. On the contrary, the reason “not use” indicated that the product might be irrelevant to participants, and these participants were less interested and asked fewer questions. Two possibilities thus characterized *familiarity* as a factor predicting atypicality. First, consumers needed more product information and had positive emotions when the products were relevant; second, consumers did not need product information and experienced negative emotions when the products were less relevant.

The factor *exposure frequency* was reflected by the reason codes “not common” and “common”. Compared to “common”, “not common” was more likely to be associated with questions about product benefits or functions (Figure 3.1) and with negative emotions (Figure 3.2). The negative emotions may signal less interest in products that were not exposed in the past and will appear less in the future (Dubey & Griffiths, 2020). *Exposure frequency* as a factor predicting atypicality was associated with information about product benefits or functions and negative emotions.

The factor *attitudes towards products* was reflected by the reason code "positive attitude" and "negative attitude". The locations of the attitudes in the reasons-questions (Figure 3.1) and the reasons-emotions (Figure 3.2) correspondence maps showed that positive attitudes were associated with more questions and positive emotions, and that negative attitudes were associated with fewer questions and negative emotions. Moreover, positive attitudes were more likely to associate with access related questions, compared to benefit related questions. The *attitudes towards products* predicted atypicality perceptions and the valence of emotions.

The factor *benefit/function thinking* included the reason codes "understand benefit", "doubt benefit", and "doubt function". "Understand benefit" was more likely to be associated with questions about accessibility (Figure 3.1) and with positive emotions (Figure 3.2). "Doubt function" was more likely to be associated with questions about product benefits (Figure 3.1) and with negative emotions (Figure 3.2). Participants who provided the reason "doubt benefit" asked fewer questions. This result differs from the association between "doubt function" and questions about functions or benefits. As a reason given by participants, doubting the benefit of a product may already be a question. Therefore participants may have few, if any, other questions about the product. Thus, reason code "doubt benefit" and "doubt function" were associated with product information about benefits or functions. For the factor *benefit/function thinking*, the product information and emotions thus depended on whether participants understood the product functions or benefits.

The factor *knowledge transfer* conveyed the meaning of the reason code "compare". "Compare" was more likely to be associated with questions about product benefits or functions (Figure 3.1). "Compare" was in the middle of the first dimension (Figure 3.2), indicating that it was related to neither positive nor negative emotions. This finding was in line with previous research indicating that when a relevant product category was activated, consumers used it as a source of information to learn about the product (Moreau, Markman, et al., 2001).

Consequently, participants either understood or generated more questions about the product functions and benefits. This, in turn, may lead to a mix of positive and negative emotions. *Knowledge transfer* was thus associated with participants' need of product information about benefits.

The factor *incongruity* was reflected by the reason codes "not match" and "fit expectation". "Not match" was more likely associated with questions about product benefits or functions (Figure 3.1) and negative emotions (Figure 3.2). Compared to "not match", "fit expectation" was more likely to associated with fewer questions (Figure 3.1) and neither positive nor negative emotions. This was in line with the previous finding that consumers who could not resolve the mismatch in the atypical product felt negative emotions (Noseworthy et al., 2014). *Incongruity* was thus associated with participants' need for product information about benefits and negative emotions.

The factor *doubt realistic* was reflected by the reason codes "doubt realistic" and "existing". Both "doubt realistic" and "existing" codes were associated with fewer questions (Figure 3.1) and negative emotions (Figure 3.2). The factor *not understand mechanism* was reflected by the reason code "not understand mechanism". This factor/reason code was more likely associated with questions about product benefits or functions (Figure 3.1) and with negative emotions (Figure 3.2).

Table 3.3 Associations among factors predicting atypicality perception, information content and emotions.

Related literature	Factors	Reason code	Question frequency	Information type: access or benefit	Emotion: positive or negative
Typicality literature (e.g., Loken & Ward, 1990)	*Distinctive attributes*	New features	More	-	Positive
	Familiarity	Not seen	More	-	Positive
		Not use	Less	-	Negative
		Seen	Less	-	Positive
		Seen similar	Less	-	Positive
		Use	Less	-	Positive
	Exposure frequency	Not common	More	Benefit	Negative
		Common	Less	-	Positive
	Attitudes towards products	Positive attitude	More	Access	Negative
		Negative attitude	Less	-	Positive
Innovation literature (e.g., Hoeffler. 2003)	*Benefit/ function thinking*	Understand benefit	More	Access	Positive
		Doubt benefit	Less	Benefit	Negative
		Doubt function	More	Benefit	Negative
	Knowledge transfer	Compare	More	Benefit	-
Incongruity literature (e.g., Meyers-Levy & Tybout, 1989)	*Incongruity*	Not match	More	Benefit	Negative
		Fit expectation	Less	-	-
New factors	*Doubt realistic*	Doubt realistic	Less	-	Negative
		Existing	Less	-	Negative
	Not understand mechanism	Not understand mechanism	More	Benefit	Negative

3.4.5 Fashion products made from repurposed materials

Finally, we explored what factors predicted consumers' atypicality perceptions of products fashion products made from repurposed materials, and whether these factors were associated with the need for (different types of) information and with emotions. Two fashion products made from repurposed materials were included in the current study: mycelium leather shoes and a backpack made from pineapple leaves (Gao et al., 2022). The results showed that three factors, namely *distinctive attributes, familiarity* and *benefit/function thinking,* were related to atypicality perceptions of the fashion products made from repurposed materials. The expected factors, *incongruity* and *exposure frequency*, did not appear. Participants raised questions about the product features or function (i.e., the durability of the materials), about the product benefit (i.e., the sustainability of the materials), the mechanism (i.e., how the material was made), the product price, and about where to buy the products. Participants showed more positive (80%) than negative (20%) emotions towards fashion products made from repurposed materials. The finding indicated that, although participants had some doubts about this type of product, their emotions towards these products were positive.

3.5 General Discussion

The current research aimed to identify and integrate the existing factors that may predict consumer perceptions concerning the atypicality of new products, and to explore whether there are also new, previously not-identified factors predicting consumers' atypicality perception. By analysing consumer-generated content on why consumers consider various products to be (a)typical, we identified nine factors predicting atypicality perceptions. Four factors are from research on typicality: *distinctive attributes, familiarity, exposure frequency, attitudes towards products*. Two factors are from research on product newness: *benefit/function thinking, knowledge transfer*. One factor is from research on product incongruity: *incongruity*. We also identified two new factors, *doubt realistic* and *not understand mechanism*, predicting atypicality perceptions. These nine factors integrate relevant but separate research lines, and newly, uncovered topics, into one framework to understand atypicality perceptions in products.

3.5.1 Theoretical Implications

The current findings extend the research on factors predicting consumers' typicality perceptions of products. Three factors, *distinctive attributes, familiarity* and *exposure frequency,* predicting typicality perceptions in previous research (Loken & Ward, 1990) also predicted atypicality perceptions in the current research. The factor, *attitudes towards products*, worked differently when predicting atypicality perceptions in the current research compared to predicting typicality perceptions in previous research (Loken & Ward, 1990). More specifically, positive attitudes towards products can predict typicality perceptions (Barsalou, 1985; Loken & Ward, 1990). However, the current research showed that both positive and negative attitudes towards products were associated with atypicality perceptions. One explanation is that consumers' attitudes towards the products might depend on the degree of atypicality perceptions, reflecting the complex relationships (an inverted U shape) between the degree of perceived atypicality and attitudes towards the product (Althuizen, 2021; Hekkert et al., 2003). We extend Loken and colleagues's work (1990) by recognizing the same four factors in consumer-generated content as predictors for both atypicality and typicality perceptions of products.

The current findings also identify the factors from research studying atypicality. The two factors *benefit/function thinking* and *knowledge transfer* have been discussed in research on innovations, where new products can be categorized as incremental and radical (really new) (Gregan-Paxton & Moreau, 2003; Mugge & Dahl, 2013; M. Zhao et al., 2012). Product *incongruity* emphasizes the mismatch between attributes and an identified product category (Jhang et al., 2012; Meyers-Levy & Tybout, 1989; Noseworthy et al., 2014). Our results show that all these three factors predicting atypicality perceptions are more likely to be associated with a need for consumers to receive more product information on the benefits of the product. This finding bridges the gap between product innovation literature and product incongruity literature by suggesting that consumers' understanding of product benefits could be crucial in both innovative and incongruent products.

Besides re-establishing seven factors identified from previous research, the current research also reveals two factors that received no explicit attention in the literature. The factor *doubt realistic* suggests that consumers may think the product is "too good to be true". The factor *not understand mechanism* implies that consumers are interested to know more about how the product works. These two factors inspire interesting topics for future research.

To further explore the factor why consumers doubt whether a product is realistic, we looked at which specific products in our examples evoked such a doubt about the reality of the product. The consumer responses in our research reveal two reasons why consumers may doubt the reality of a product. The first reason is that the product provides new benefits or functions which did not exist before, which fits the concept of really new products (Veryzer, 1998). In the current study, these products included an eye-control remoter, 3-D printed clothes, and a machine creating drinkable water from moisture in the air. To consumers, the benefits of these products might sound too good to be true. Future research might examine under what conditions consumers would believe the product benefits are realistic, thereby increasing the chance that consumers will consider buying such products. The second reason causing consumers to doubt the reality of the product could be the product's appearance. The example products from the current study were foldable phones and ear-free headphones. The appearance of these products is dramatically different from the typical products in the relevant product category. Previous research showed that really new products with a high level of design newness (appearance) could lead to negative evaluations and more learning-cost inferences (Mugge & Dahl, 2013). A reasonable suggestion is to use a low level of design newness for really new products to enhance consumers' understanding of products (Mugge & Dahl, 2013). However, in cases such as foldable phones, the new benefit is achieved by the high level of design newness. Thus, a different strategy is needed. Previous research has shown that presenting consumer reviews of a newly launched product could be a way to validate companies' claims about a new product, which in turn may increase sales (Willemsen et al., 2011). Future research might investigate whether such consumer reviews can also eliminate consumer doubts about the existence of products and the realism of the claimed benefits.

Another new factor, *not understand mechanism,* and the information about product mechanism showed consumers' curiosity of how the product works. Unlike the information that can be directly useful to consumers (e.g., product benefits, how to use the product), information about the mechanism of how the product works seems to be not directly useful to consumers. One explanation for why consumers are curious about information on product mechanisms is that learning this type of information can be rewarding. Consumers' curiosity about the product mechanism can be called non-instrumental curiosity, because this type of information is not particularly useful for helping consumers to make their purchase decision (van Lieshout et al., 2019). Another explanation for consumers' curiosity about information on the product mechanism could be that understanding the product mechanism would eventually help consumers to understand the benefits that the product may provide. This explanation was supported by the finding that the reason "not understand mechanism" was associated with questions about product benefits. It is interesting to explore the existence of consumers' non-instrumental curiosity related to a product, and to reveal whether it would influence consumers' purchase behaviour.

3.5.2 Practical implications

The current research explores the associations among factors predicting atypicality perception, information contents and emotions. We did not find one-to-one correspondences between specific information contents or emotions and factors predicting atypicality perceptions. Two distinguishable patterns did show up. First, it appeared that consumers' need for information about product benefits is associated with negative emotions. Second, it appeared that understanding product benefits is associated with positive emotions and the need for information about product accessibility. Combining these two patterns, we infer that, only when consumers understand the product benefits, they are likely to experience positive emotions towards the product, and they need more information about the product accessibility. Our inference supports the marketing strategy to emphasize information such as superior quality or new benefits for innovative products (Talke & Colarelli O'Connor, 2011). Moreover, our findings suggest that product information about product benefits should be prioritised more to introduce to consumers than information about product accessibility.

3.5.3 Atypicality perceptions of fashion products made from repurposed materials

Three factors, *distinctive attributes, familiarity* and *benefit/function thinking*, predicted consumers' atypicality perceptions of fashion products made from repurposed materials. Consumers need information about the quality and sustainability of the target products. These findings reveal consumers' uncertainties about whether repurposed materials can satisfy basic functional performances of fashion products, and about whether repurposed materials are more sustainable than conventional materials. The current study did not show *incongruity* as a source of atypicality perceptions. However, the finding that consumers' uncertainty of functional performances could be a factor to predict atypicality perceptions of fashion products was in line with the previous chapter (Chapter 2), where we studied incongruity perceptions of fashion products made from repurposed materials (Gao et al., 2022). This indicates that perceived product function is central for consumers to judge both atypicality and incongruity perceptions of the target product.

Another uncertainty consumers have about fashion products made from repurposed material atypical is whether repurposed materials are more sustainable than conventional materials. The factor *familiarity* and the need for information about product sustainability indicate that the sustainability benefits of replacing conventional materials with repurposed materials is not obvious to some consumers. Future research could examine how repurposed and conventional materials influence consumers' perceptions of functions and sustainability of fashion products made from repurposed materials.

Our findings could help marketers decide which product information should be included when launching a fashion product made from repurposed materials. Even though consumers experience doubts about the function and benefits of fashion products made from repurposed materials, their emotional responses to such products are more likely to be positive. The positive emotions signify that consumers might be open to repurposed materials as an alternative option for fashion products. Marketers need to communicate two essential messages to consumers. First, repurposed materials can achieve the same level of product function/quality as conventional materials; second, repurposed materials are more sustainable than conventional materials

3.5.4 Limitations and future research

The current study has some limitations. First, we only recorded one emotion per product, whereas one product may evoke multiple emotions simultaneously (Desmet, 2003). Although only recording one emotion allowed us to capture the most salient emotion consumers experience when encountering a product, our findings may not capture the whole array of emotional responses to a product. Moreover, the current study only revealed the associations between factors predicting atypicality and the valence of emotions. The results were not distinctive enough to demonstrate associations between the factors and specific emotions. Although we found that anger stood out from other emotions when corresponding emotions to reasons or questions, it was unclear why only anger was distinguishable. Future research may discover how multiple or mixed emotions could be associated with specific factors predicting atypicality, and why they might be associated.

Second, the current study attempted to discover factors that can predict atypicality perceptions beyond product types or specific products. Although we identified factors in fashion products made from repurpsoed materials, the results did not imply that specific factors only appeared in certain product types. We cannot exclude the possibility that certain factors predicting atypicality perceptions only appear in specific products. As companies will eventually focus on a specific new product, practical research can apply the associations between factors predicting atypicality perceptions and consumer responses discovered in the current study to specific products.

3.6 Conclusion

Our findings provide new insights into what factors could predict atypicality perception in products, and how these factors are associated with the need for different product information and emotions. We identified nine factors predicting atypicality perception and two patterns revealing the associations between the need for information and emotion valence. These new insights spur the interest of scholars and marketers to study the potentials and weaknesses of identifying and understanding the various dimensions of atypicality in new products.

Chapter 4

Fashion products made from repurposed materials: The role of function, sustainability and distinguishability attributes and their trade-offs in consumer preferences

This chapter is based on Gao, X., De Hooge, I. E., & Fischer, A.R.H. Fashion products made from repurposed materials: The role of function, sustainability and distinguishability attributes and their trade-offs in consumer preferences. (under review)

Abstract

Fashion products made from repurposed materials (e.g., backpacks made from pineapple leaves) have become more prevalent nowadays, and their environmental sustainability is one of the core advantages. Yet, it is currently unclear how consumers respond to products made from repurposed materials. We conducted three experiments to examine the effects of three material features, namely function, sustainability, and distinguishability, on consumer preferences for fashion products made from repurposed materials. The results indicate that, when the function of repurposed materials is as good as that of conventional materials, consumers prefer a product made from repurposed materials over the same product made from conventional materials. Also, consumers in general prefer repurposed materials to be less visually distinguishable. Finally, when the sustainability of the repurposed products is emphasized, consumers appear more likely to choose products made from repurposed materials, even when these products have an inferior function. In conclusion, to promote fashion products made from repurposed materials, marketers may emphasize the function and sustainability of repurposed materials, and producers may manufacture repurposed materials that visually resemble conventional materials.

Key words: fashion products, repurposed materials, product attributes, sustainability

4.1 Introduction

The fashion industry has been criticized for its substantial negative environmental impact. It produces around 10% of global CO_2 emissions, 20% of industrial water pollution from textile treatment and dyeing, 35% of primary microplastic pollution per year, a vast amount of textile waste, and consumes extensive amounts of water (Niinimäki et al., 2020). One way to reduce the negative impact of the fashion industry on the environment is to offer consumers new fashion products that are made from repurposed materials. Repurposed materials are those materials whose conventional use is changed into a new use (Bridgens et al., 2018; Kamleitner et al., 2019). For example, pineapple leaves are conventionally used as fertilizers or thrown away as waste, but they can be repurposed as a leather alternative to make backpacks. Plastic bottles are conventionally recycled and converted into new bottles, but they can be repurposed as fabrics for T-shirts. The use of repurposed materials has less negative impact on the environment compared to the use of conventional materials (de Oliveira et al., 2021; Hazarika et al., 2017).

To market fashion products made from repurposed materials, understanding consumer responses to such products is essential. Replacing conventional materials with repurposed materials to produce fashion products could cause several changes in product attributes, such as in the strength, texture, shape of the materials. These changes may lead to changes in consumer perceptions of product attributes, eventually leading to different consumer responses to the product. According to Rogers' framework of diffusion of innovations, five product attributes are crucial to predict an innovation's rate of adoption, namely, compatibility, observability, relative advantage, complexity and trialability (Rogers, 2004). The current research argues that three of these five attributes are relevant for examining consumer responses to fashion products made from repurposed materials. First, the compatibility of an innovation with the experiences that consumers have with the product that is replaced. Second, the relative advantage of an innovation being better than the idea it supersedes. Third, the observability of the results of an innovation to other people. We propose three specific attributes in fashion products could correspond to these three attributes proposed by Rogers in the framework of diffusion of innovations (2004). These three specific attributes in fashion products are the function, the sustainability and the visual distinguishability of the materials in products

Previous research has shown the effects of function, sustainability and visual distinguishability attributes on consumer preference for different types of products, such as cell phones, electric cars (Luchs et al., 2012; Noppers et al., 2015). Generalising findings from the effects of these examined products' function, sustainability, and visual distinguishability on consumer responses to fashion products made from repurposed materials may directly support marketing strategies of such products. However, given the distinct differences between electronics, cars and fashion products, it is insufficiently clear whether, and if so to what extent, findings from previous research can be generalised to fashion products made from repurposed materials.

The current research aims to gain a better understanding of how the effects of the function, sustainability, and visual distinguishability attributes of fashion products made from repurposed materials influence consumer responses to such products. We do so by examining this research question from three aspects. First, the current research contributes to the literature on repurposed materials by examining how consumers evaluate products made from such materials in situations where provided attribute information conflicts with pre-existing consumer perceptions. For example, research has shown that repurposed materials evoke inferior function perceptions (Gao et al., 2022). It is unclear how consumers respond to fashion products made from repurposed materials when additional product information suggests that the product function of repurposed materials is not inferior to that of conventional materials. Second, the current research extends research on the effects of product attributes on consumer responses to the target products by examining the attribute effects in three contexts. We examine the effects of product attributes on consumer responses in contexts where consumers: (A) evaluate a single product made from either repurposed or conventional materials with attribute information; (B) compare two products with attribute information where one product is made from repurposed materials and the other is made from conventional materials; and where consumers (C) compare two products with attribute information when both products are made from repurposed materials. As choice contexts in which products are presented may influence consumer responses to product attributes (e.g., Chitturi et al., 2007; Luchs & Kumar, 2017), studying consumer responses in different contexts may provide insights into the generalizability of our findings. Third, the insights generated from our research may help marketers to increase the success of fashion products made from repurposed materials by providing specific marketing strategies regarding to function and sustainability attributes, and providing a specific design suggestion regarding to the visual distinguishability attribute.

4.2 Literature Review

A product function has been defined as the product's ability to fulfil its purpose (Bloch, 2011; Homburg et al., 2015). In the current research, the function product attribute of a fashion product refers to the product's fulfilment of its essential purpose. This can be indicated by product materials, such as cottons indicating T-shirts' breathability, or leather indicating backpacks' sturdiness (Gao et al., 2022). We argue that the attribute 'function' can be relevant to the compatibility attribute of innovation, which stands for the extent to which an innovation is perceived to be consistent with values of existing products (Rogers, 2004). For fashion products made from repurposed materials to be compatible with those made from conventional materials, the functional performance of repurposed materials needs to be as good as that of conventional materials.

Although the functional performance of repurposed materials in fashion products could be as good as that of conventional materials in fashion products (Hazarika et al., 2017), previous research has shown that repurposed materials (pineapple leaves as backpack materials) can evoke inferior function perceptions compared to conventional materials (Gao et al., 2022). Inferior function perceptions may lead to lower product evaluations (Mugge et al., 2017; van Weelden et al., 2016). We expect that information emphasizing that the function of repurposed materials is as good as that of conventional materials may change consumers' perceived function of the products. This perception change might influence consumer responses to the product made from repurposed materials.

In the current research, the sustainability attribute refers to the environmental outcomes of the use of certain materials. It includes the amount of pollution and water consumption during production. We argue that the sustainability attribute in fashion products made from repurposed materials is a relevant relative advantage (Rogers, 2004) over conventional fashion products. This is because the main advantage of replacing conventional materials with repurposed materials to make fashion products is sustainability related, that is, less polluting and resource intensive (Hazarika et al., 2017; Jones et al., 2021; Ribul et al., 2021).

Previous research has indicated that consumers perceive remanufactured products to be sustainable (Michaud & Llerena, 2010; Mugge et al., 2017). This higher perceived sustainability may also be extended to repurposed materials, for example, T-shirts made from recycled plastic bottles (Magnier et al., 2019). The current research first examines whether consumers indeed perceive repurposed materials to be more sustainable than conventional materials. Then we examine whether the sustainability attribute can influence consumer responses in the contexts of comparing two products made from repurposed materials, and of comparing one product made from repurposed materials to another made from conventional materials.

Distinguishability can be defined as whether repurposed materials are visually distinguishable from conventional materials. Distinguishability in repurposed materials is relevant to the observability attribute, which means the degree to which the results of an innovation are visible to other consumers (Rogers, 2004). Repurposed materials, as the innovative part of fashion products, can be either visually distinguishable or not distinguishable from conventional materials. When wearing fashion products made from repurposed materials that are visually distinguishable from conventional materials, other consumers are more likely to recognize the repurposed materials.

Previous research has shown that observability can increase pro-environmental behaviours (Bateson et al., 2013; Brick et al., 2017). This finding can be explained with costly signalling theory (Bliege Bird & Smith, 2005; Griskevicius et al., 2010). Consumers who purchase green products that are inferior in function compared to luxury products that are superior in function, costly signal to other people that they have sufficient resources to afford the negative impact on themselves (Griskevicius et al., 2010). Therefore, consumers are expected to respond more positively to products with highly distinguishable repurposed materials than to non-distinguishable repurposed materials. However, there is also evidence that consumers buy sustainable products to establish and confirm their pro-environmental identity regardless of visual conspicuousness (Castagna et al., 2022; Kashima et al., 2014; van Dam & Fischer, 2015). This suggests that consumers care less about visual distinguishability in repurposed materials. As both explanations seem feasible, the current research explores the effect of distinguishability on consumer responses to fashion products made from repurposed materials.

We argue that the final two attributes of Rogers' framework of diffusion of innovation (2004), namely, complexity and trialability, are less relevant to fashion products made from repurposed materials. The trialability attribute is less relevant because trying out fashion products made from repurposed materials is unlikely to help consumers understand the core benefits of repurposed materials (sustainability) better. The complexity attribute refers to the difficulty of learning how to use the innovation (Rogers, 2004). As the current research focuses on regular fashion products made from repurposed materials (i.e., T-shirts, shoes and backpacks), consumers do not need to learn how to use these products. Thus, we argue that the complexity attribute will not be relevant in the current research.

Merely looking at the main effects of three attributes might not reveal the entire picture of how these three attributes together influence consumer responses to fashion products made from repurposed materials. Consumers may make trade-offs between product attributes when making product choices. The trade-off effect proposes that consumers attach more weight to one attribute than to another attribute when only one of two attributes in products meets consumers' requirements (Chitturi et al., 2007, 2008). We explore the trade-off effects between function and sustainability, and between function and distinguishability, in the context where consumers compare products made from repurposed materials to products made from conventional materials. The comparison between repurposed and conventional materials satisfies the assumption that, compared to conventional materials, repurposed materials are associated with an inferior function and superior environmental sustainability (Gao et al., 2022; Lin & Chang, 2012).

A trade-off between function and sustainability occurs when consumers either choose a product satisfying the function requirement or a product satisfying the sustainability requirement. Previous research found that when the product function does not meet consumers' requirements, consumers are less likely to choose a product with superior sustainability attribute than a product with superior function attribute (Luchs & Kumar, 2017). We first explore whether consumers indeed perceive products made from repurposed materials to be inferior in function and superior in sustainability, and then explore whether the trade-off between function and sustainability occurs based on (1) consumers' spontaneous perceptions of sustainability without explicitly presenting sustainability information, and (2) explicit information about the sustainability attribute.

Following costly signalling theory (Griskevicius et al., 2010), the trade-off between function and distinguishability refers to consumers either choosing a non-sustainable product that satisfies consumers' function requirements, or a sustainable product that is visually distinguishable but fails to satisfy function requirements. When consumers have to choose between luxury products and sustainable products, they tend to choose sustainable products when the purchase is made publicly (Griskevicius et al., 2010). When repurposed materials convey sustainability messages, visually distinguishable repurposed materials can signal to other people that the wearer cares about sustainability issues and has sufficient resources to afford a negative impact on themselves. We explore whether such a trade-off between function and distinguishability also occurs when consumers compare products made from repurposed materials to products made from conventional materials.

Finally, the current research explores whether explicitly presenting the sustainability attribute is needed for the trade-off between function and sustainability or between function and distinguishability to occur. Research on trade-off effects usually explicitly mentions product attributes (Luchs et al., 2012; Luchs and Kumar, 2017), whereas repurposed materials might *imply* a superior sustainability attribute and an inferior function. We will therefore examine whether the trade-off effects will occur without explicitly providing information on the product attributes, and whether providing information on the sustainability attribute will affect the trade-offs.

In sum, the current research investigates the effects of the function, sustainability and distinguishability attributes, and the relevant trade-off effects between these attributes, on consumer responses to fashion products made from repurposed materials in three different contexts. This is done in three experiments. Experiment 1 investigates the effects of the function and distinguishability attributes in a context where consumers evaluate one product. Experiments 2 and 3 examine the effects of those attributes in two contexts: choosing between a product made from repurposed materials and a product made from conventional materials, and between two products made from repurposed materials. Experiment 2 examines the occurrence of the trade-off effects without and experiment 3 with presenting sustainability attribute information.

We pre-registered the planned sample sizes, analyses, and predictions of all experiments. The link can be found in the section Pre-registrations and data open access at the end of this book.

4.3 Experiment 1

Experiment 1 examined the effects of function and distinguishability on product evaluations and willingness to buy of fashion products made from repurposed materials. Experiment 1 consisted of experiments 1a and 1b, which only differed in the manipulation of distinguishability. In experiment 1a pictures and text descriptions of materials were presented to consumers; in 1b the pictures were omitted.

4.3.1 Method

Participants and design

Participants in both experiments were UK residents recruited from the online platform Prolific for monetary compensation. Participants (1a: N = 400, M_{age} = 33.53, SD = 11.27, 63% females; 1b: N = 400, M_{age} = 32.95, SD = 10.43, 64.5% females) were randomly assigned to either a control condition or to one of the conditions of a 2 (function: high vs. low) × 2 (distinguishability: high vs. low) between-subjects design.

Stimuli

Experiment 1 used backpacks as products. In the control condition, the material of the backpack was conventional, described as “this backpack is made from leather.”

The function was described as “the leather material can withstand abrasion, colour fading, and seam rupture”, and the distinguishability as “the leather material makes this backpack look no different from other leather backpacks.” In the four experimental conditions, the material of the backpack was repurposed and described as “this backpack is made from pineapple leather, a leather alternative made from pineapple leaf fibres”. The high [low] function condition read “the pineapple leather material *can [to some degree]* withstand abrasion, colour fading, and seam rupture as good as real leather.” The high [low] distinguishability condition read “the pineapple leather material makes this backpack look *unique compared to [very much like]* real leather backpacks”.

Measures

Product evaluation was the average of a four-item semantic differential scale (7-points, ranging from: negative to positive; good to bad; dislike to like; undesirable to desirable, Cronbach’s α_{1a} = .95; α_{1b} = .96) (Crites et al., 1994). Willingness to buy was measured with the item "I am willing to buy this backpack” (Mugge et al., 2017). We included manipulation checks for function (the item "I perceive this backpack has a good quality"), and distinguishability (two items averaged, "I can tell the material of this backpack looks different than leather backpacks" and "I believe other people can tell the material of this backpack looks different than leather backpacks", Cronbach’s α_{1a} = .85; α_{1b} = .91). Environmental concern was measured with the item, "The issue of corporate environmental responsibility is important to me, e.g., recycling, energy efficiency, minimizing pollution" (Luchs et al., 2012). The willingness to buy, manipulation checks, and environmental concern items were measured on 7-point Likert scales (1 = “strongly disagree”, 7 = “strongly agree”).

Procedure

After reading and signing the informed consent, participants read a scenario in which they had plans to buy a new backpack. They were then randomly assigned to the control or one of the four experimental conditions. Next, participants provided their evaluation and willingness to buy of the backpack. Participants answered the manipulation check questions with the condition presented again. Finally, participants provided demographic information (age, gender) and indicated their environmental concern.

4.3.2 Results

Manipulation check

For every attribute, we compared the values of the related measure in the high, low and control condition. The manipulation of function was successful in both 1a and 1b (Table 4.1). Independent t-tests showed that participants perceived the product in the high function condition to be of a better quality than the product in the low function condition. Participants perceived the product in the control condition to be of a better quality than the product in the high function condition in 1a but not in 1b.

Table 4.1 Experiment 1 and 3 manipulation check: perceived attributes Mean (SD).

Perceived attribute	Experiment	High	Low	Control
Function	1a	5.60 (0.85)^{a}	5.16 (1.11)^{b}	5.89 (0.91)^{c}
	1b	5.70 (1.02)^{a}	5.08 (1.21)^{b}	5.59 (1.02)^{a}
	3a	5.57 (1.08)^{a}	4.02 (1.28)^{b}	5.89 (1.03)^{c}
	3b	5.44 (1.09)^{a}	4.11 (1.29)^{b}	5.47 (1.14)^{a}
Distinguishability	1a	3.70 (1.39)^{a}	3.59 (1.33)^{a}	3.10 (1.40)^{b}
	1b	5.58 (1.04)^{a}	3.76 (1.24)^{b}	2.56 (1.35)^{c}
	3a	5.53 (0.96)^{a}	3.65 (1.53)^{b}	2.34 (1.56)^{c}
	3b	4.56 (1.56)^{a}	3.54 (1.53)^{b}	2.58 (1.42)^{c}
Sustainability	1a	-	-	-
	1b	-	-	-
	3a	5.71 (1.05)^{a}	4.87 (1.40)^{b}	2.78 (1.59)^{c}
	3b	5.41 (1.12)^{a}	4.16 (1.42)^{b}	2.65 (1.40)^{c}

Note: Scales from 1 to 7. Values in the same row sharing a superscript character are not significantly different (p > .05). We did not conduct manipulation checks in Experiment 2.

The manipulation of distinguishability was only successful in 1b. In both experiments, participants perceived the repurposed material in the low distinguishability condition to look different than the conventional material in the control condition. But only in 1b, independent t-tests showed that participants perceived the repurposed material in the high distinguishability condition to look more different from conventional material compared to the repurposed material in the low condition. See the specific results of each comparison in the manipulation check of experiment 1 in Table F, Appendix F.

The effects of attributes on evaluation and willingness to buy

Data were analysed with regressions[1], with function, distinguishability, environmental concern, and the interaction between environmental concern and distinguishability as predictors, and product evaluation or willingness to buy as outcomes. To allow for interpretation of both main and interaction effects of each attribute in all experiments, high and low conditions were effect coded as 0.5 and -0.5, and environmental concern was grand mean centred. The results showed significant main effects of function and of environmental concern in both experiments[2] (Table 4.2). Participants who saw products with a high function description evaluated the products more positively and were more willing to buy the products than participants who saw products with a low function description (marginally significant in willingness to buy in 1b, p = .09). Participants who were more concerned about the environment evaluated the repurposed products more positively and were more willing to purchase the products made from repurposed materials. There was no main effect of distinguishability, nor an interaction effect between environmental concern and distinguishability.

An additional regression with the five conditions (dummy coded) as predictor showed that product evaluation and willingness to buy were higher for all four experimental conditions compared to the control condition (marginally significant

[1] Different from the pre-registration, we conducted linear regressions instead of ANOVA to maintain consistency across all three experiments. The conclusions remained the same.

[2] In all experiments, we also ran the full model including all two-way and three-way interactions attributes and environmental concern. In none of the experiment this provided additional insights beyond the reported model. See the specific results in Table J, Appendix J.

in willingness to buy between the low function-high distinguishability and control condition in 1a, p = .06) (Figure 4.1).

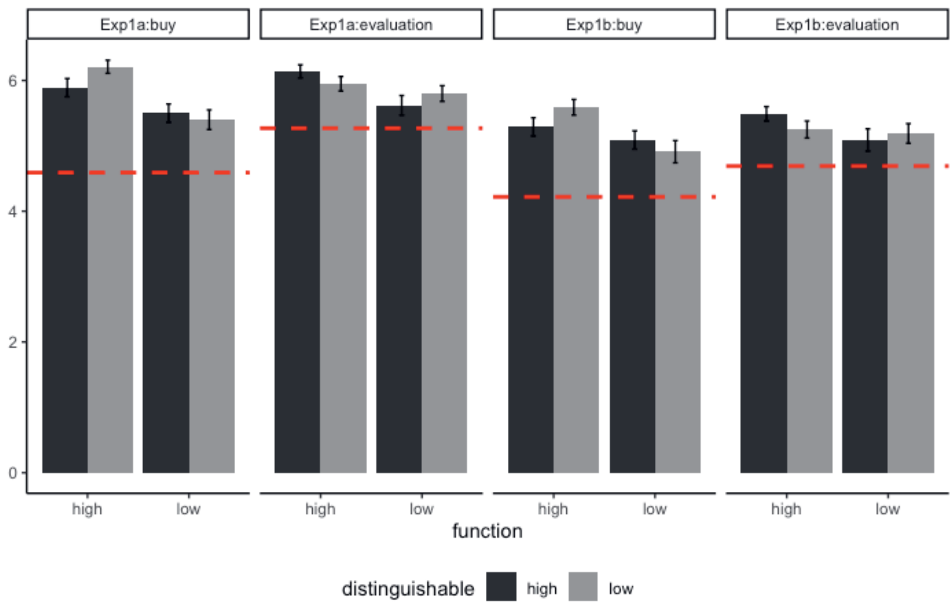


Figure 4.1 Mean willingness to buy (buy) and product evaluation for the experimental conditions (bars) and control conditions (dotted lines) in Experiment 1. Error bars indicate 95% CI of mean score for each condition.

Table 4.2 Experimental effects (regression coefficients) in Experiment 1.

Effect	Experiment	Measure	*b*	*se*	*t*	*p*
Function	1a	Evaluation	0.33	0.11	2.94	**.004**
		Willingness to buy	0.23	0.13	1.71	.090
	1b	Evaluation	0.58	0.12	4.72	**<.001**
		Willingness to buy	0.43	0.14	3.14	**.002**
Distinguishability	1a	Evaluation	0.01	0.11	0.05	.956
		Willingness to buy	0.07	0.13	0.50	.614
	1b	Evaluation	-0.17	0.12	-1.40	.156
		Willingness to buy	-0.12	0.14	-0.90	.362
Environmental concern	1a	Evaluation	0.38	0.05	7.00	**< .001**
		Willingness to buy	0.41	0.07	6.29	**< .001**
	1b	Evaluation	0.39	0.06	6.83	**< .001**
		Willingness to buy	0.36	0.06	5.76	**< .001**
Environmental concern× Distinguishability	1a	Evaluation	0.03	0.11	0.25	.804
		Willingness to buy	0.18	0.13	1.35	.614
	1b	Evaluation	0.10	0.11	0.89	.377
		Willingness to buy	-0.10	0.13	-0.79	.431
Total model F-statistic	1a	Evaluation	$F(4,314) = 14.33$			**< .001**
		Willingness to buy	$F(4,314) = 11.14$			**< .001**
	1b	Evaluation	$F(4,314) = 18.03$			**< .001**
		Willingness to buy	$F(4,314) = 11.24$			**< .001**

4.3.3 Discussion

Experiment 1 showed that describing the function of repurposed materials to be as good as that of conventional materials positively affected consumers' product evaluations and willingness to buy. Distinguishability of fashion products made from repurposed materials did not affect consumer evaluations and willingness to buy. As the evidence showed that the manipulation for distinguishability was successful for the text only version, further experiments will only use text to present material distinguishability. Even with only texts, no effect of distinguishability was found. This may be because visual distinguishability suggests comparisons between at least two products, and hence may not be relevant to the isolated evaluations in experiment 1. To examine the effects of both function and distinguishability experiment 2 focused on consumer choices between two products.

4.4 Experiment 2

Experiment 2 aimed to replicate and expand the findings of Experiment 1 when consumers compare two products. It focused on comparisons between: (1) a product made from repurposed materials and a product made from conventional materials, and between (2) two products made from repurposed materials. Experiment 2a used backpacks as products, and 2b used T-shirts. Experiment 2b also examined participants' perception of environmental sustainability of the materials used in 2a and 2b.

4.4.1 Method

Participants and design

Each experiment was planned to have 100 participants. In total 98 participants in 2a (M_{age} = 31.91, *SD* = 10.96, 65% females) and 100 participants in 2b (M_{age} = 35.76, *SD* = 10.75, 50% females) were recruited. Experiment 2 applied a five-conditions within-subjects design, consisting of 2 (function: high vs. low) × 2 (distinguishability: high vs. low) experimental conditions for the repurposed materials, and a control condition with conventional materials.

Stimuli

In experiment 2a, backpacks and pineapple leaves/real leather were used. The function of materials was described as “withstanding: abrasion, colour fading, seam rupture”, and the distinguishability of materials was described as “material appearance”. In the four experimental conditions, the (repurposed) material was described as “pineapple leaf fibres as a leather alternative”. The high [low] function condition read “*[not] as good as* real leather”. The high [low] distinguishability condition read “*unique compared to [very much like]* real leather”. In the control condition, the (conventional) material was “real leather”, with a “good” function, and a “no different than other real leather” distinguishability.

In 2b, T-shirts and bamboo fibres/cotton fibres were used. Function was described as “durability, softness, washability, breathability”, and distinguishability as “material appearance”. In the four experimental conditions, the (repurposed) material was described as “bamboo fibres as cotton alternative”. The high [low] function condition read “*[not] as good as* cotton fibres”. The high [low] distinguishability condition read “*unique compared to [very much like]* cotton fabrics”. In the control condition, the (conventional) material was described as “cotton fibres”, with a “good” function, and a “no different than other cotton fabrics” distinguishability.

The five conditions were converted to product profiles (Figure 4.2). We created 10 choice sets of two products: four choices between each product from the full factorial design with the repurposed material and the conventional material product, and all six possible choices between two products with the repurposed material. Participants’ choices were the main outcome. See specific comparisons of experiment 2 in Table G, Appendix G.

	Brand A	Brand E	Brand A	Brand B
Material	Pineapple leaf fibres as a leather alternative	Real leather	Pineapple leaf fibres as a leather alternative	Pineapple leaf fibres as a leather alternative
Durability Softness Washability Breathability	As good as real leather	Good	As good as real leather	As good as real leather
Material appearance	Unique compared to real leather	No different than Other real leather	Unique compared to real leather	Very much like real leather

	Brand A	Brand E	Brand A	Brand B
Material	Bamboo fibres as cotton alternative	Cotton fibres	Bamboo fibres as cotton alternative	Bamboo fibres as cotton alternative
Durability Softness Washability Breathability	As good as cotton fibres	Good	As good as cotton fibres	As good as cotton fibres
Material appearance	Unique compared to cotton fabrics	Not different from other cotton fabrics	Unique compared to cotton fabrics	Very much like cotton fabrics

Figure 4.2 Examples of choices comparing repurposed to conventional material (left) and two repurposed materials (right) in 2a (top) and 2b (bottom).

Measures

The measure of environmental concern was identical to Experiment 1. To examine the assumption that consumers perceive repurposed materials as more sustainable than conventional materials, in 2b we measured participants' perceived environmental sustainability of the four materials (leather and pineapple leaves fibres for making backpacks, cotton and bamboo fibres for making T-shirts) on 7-point Likert scales (1 = "not at all environmentally sustainable"; 7 = "completely environmentally sustainable").

Procedure

Participants read a scenario in which they had plans to buy a product from a selection of five backpacks (2a) or T-shirts (2b). They then selected the preferred products from the 10 choice sets. The position of the products (left, right) and the order of the choices were randomized. After the choice task, participants provided perceived sustainability of the materials (2b only), indicated the demographic information (age and gender) and their environmental concern.

4.4.2 Results

Perceived sustainability of materials

Paired sample t-tests in 2b showed that participants perceived pineapple leaves to be more sustainable than real leather, $t(99) = 13.09$, $p < .001$, $d = 1.31$, 95%CI = [1.03, 1.71]; and bamboo fibres to be more sustainable than cotton, $t(99) = 11.93$, $p < .001$, $d = 1.19$, 95%CI = [0.95, 1.49]. This supports the trade-off effect assumption that participants perceived repurposed materials as more sustainable. Higher environmental concern was correlated with a larger perceived difference in sustainability between pineapple leaves and real leather, $r = .40$, $t(98) = 4.26$, $p < .001$, and marginally correlated with the bamboo-cotton difference, $r = .18$, $t(98) = 1.84$, $p = .070$. This suggests that people with higher environmental concern are more sensitive towards perceiving the sustainability of materials.

Comparing repurposed to conventional

The four choices between a product made from repurposed materials and a product made from conventional materials were analysed with multilevel binary logistic regressions, in which the attributes only varied in the product made from repurposed materials. The same four predictors as in experiment 1 were entered as fixed effects to predict participants' choices. Participant number was entered as a random intercept. The regression coefficients were exponentiated to indicate odds ratios. Experiment 2a and 2b showed similar results (Figure 4.3, Table 4.3). The intercept was not significant, indicating that participants showed in general no preference for repurposed or conventional materials. The main effect of function revealed that participants were more likely to choose repurposed over conventional materials when the function was high rather than low. Participants with higher environmental concern were more likely to choose repurposed over conventional materials. The main effect of distinguishability and the interaction between distinguishability and environmental concern were not significant.

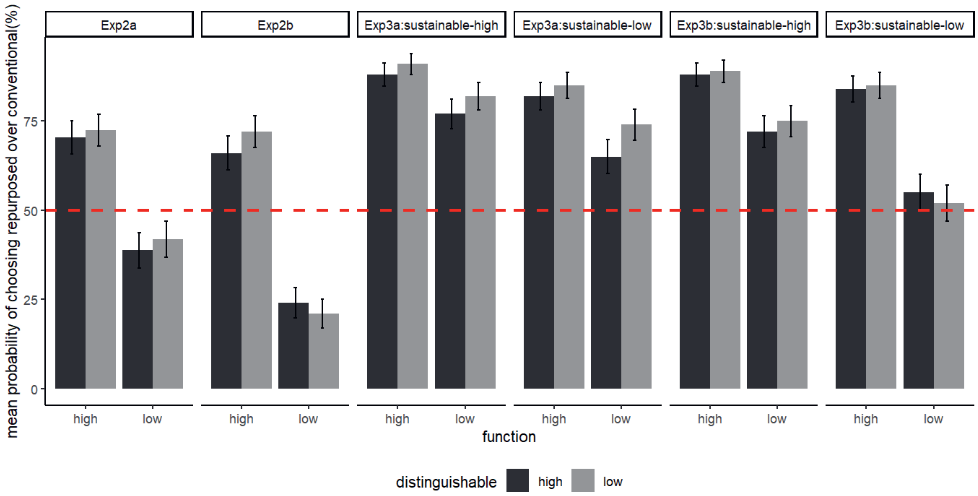


Figure 4.3 Probability of choosing repurposed over conventional materials in Experiment 2 and 3. Error bars indicate 95% CI of mean probability for each experimental condition.

Table 4.3 Experimental effects when comparing repurposed to conventional choices in Experiment 2 and 3.

Effect	Experiment	Odds Ratio[a]	95%CI	*p*
Intercept[b]	2a	2.90	0.89, 9.42	.077
	2b	0.72	0.48, 1.08	.113
	3a	407.73	35.28, 4712.47	**<.001**
	3b	14.12	6.91, 28.86	**<.001**
Function	2a	83.94	18.34, 384.14	**<.001**
	2b	22.15	10.41, 47.16	**<.001**
	3a	8.06	4.02, 16.18	**<.001**
	3b	14.72	7.88, 27.48	**<.001**
Distinguishability	2a	0.70	0.33, 1.48	.354
	2b	0.91	0.53, 1.57	.746
	3a	0.43	0.23, 0.79	**.007**
	3b	0.91	0.54, 1.51	.706
Sustainability	2a	-	-	-
	2b	-	-	-
	3a	4.06	2.12, 7.77	**<.001**
	3b	3.71	2.16, 6.39	**<.001**
Environmental concern	2a	14.58	3.06, 69.39	**.001**
	2b	1.94	1.38, 2.74	**<.001**
	3a	8.00	2.18, 29.44	**.002**
	3b	5.96	3.24, 10.98	**<.001**
Environmental concern× Distinguishability	2a	1.54	0.67, 3.52	.305
	2b	0.94	0.60, 1.47	.785
	3a	0.91	0.41, 2.00	.817
	3b	1.12	0.83, 2.09	.235
Environmental concern× Sustainability	2a	-	-	-
	2b	-	-	-
	3a	2.98	1.26, 7.09	**.013**
	3b	1.32	0.83, 2.09	.235

Notes: a. Odds ratio above (below) 1 indicates participants are more likely to choose repurposed (conventional) over conventional (repurposed) materials. b. The intercept indicates the overall probability of choosing repurposed over conventional materials.

The trade-off effects, between function and distinguishability, and between function and sustainability, were explored on the two choices where the repurposed materials had a low function compared to conventional materials (that always had a superior function). The trade-off between function and distinguishability was analysed with multilevel binary logistic regression, with distinguishability as a fixed effect, participant as a random intercept. Results showed that distinguishability did not influence product choice (Odds Ratio_{2a} (OR) = 0.31, 95%CI = [0.05,2.06], $p = .227$; 2b: $\text{OR}_{2b} = 1.35$, 95%CI = [0.56, 3.26], $p = .510$), indicating no evidence for the occurrence of a trade-off between function and distinguishability.

To analyse the trade-off between function and sustainability, we first marginalized high and low distinguishability conditions, which were irrelevant in this case. Then, across these two conditions, we compared the low function, high sustainable repurposed materials to the high function, low sustainable conventional materials twice. Adding up the two choices, outcomes of each participant could be 0, 1, or 2 repurposed choices. Data were analysed with binomial logistic regression, with environmental concern as predictor (Table 4.4). In both 2a and 2b the intercept was below 1, indicating that participants with an average environmental concern were more likely to sacrifice sustainability for function. The odds ratio of the effect of environmental concern was above 1, indicating that, with increasing environmental concern, participants were more likely to sacrifice function for sustainability.

Table 4.4 Trade-off between function and sustainability.

Effect	Experiment	Odds Ratio[a]	95%CI	*p*
Intercept[b]	2a	0.64	0.47, 0.86	**.004**
	2b	0.27	0.19, 0.38	**<.001**
	3a	3.13	2.48, 3.99	**<.001**
	3b	1.82	1.46, 2.29	**<.001**
Environmental concern	2a	2.29	1.58, 3.45	**<.001**
	2b	1.43	1.06, 2.00	**.027**
	3a	1.90	1.46, 2.49	**<.001**
	3b	2.50	1.97, 3.25	**<.001**

Notes: a. Odds ratio above (below) 1 indicates participants are more likely to choose repurposed (conventional) over conventional (repurposed) materials. b. The intercept indicates the overall probability of choosing repurposed over conventional materials.

Comparing repurposed to repurposed

The six choices in which participants compared two products with the same repurposed material were analysed with logistic regression, in which the attributes varied in both options (conjoint analysis). The predictors were the same as in experiment 1, except that environmental concern was not included as a predictor[3]. The main effect of function was significant in experiments 2a and 2b (Table 4.5): participants were more likely to choose high over low function repurposed materials. Distinguishability was only significant in 2b: participants were more likely to choose the low over high distinguishable repurposed materials. A significant interaction in 2b between distinguishability and environmental concern indicated that the preference for low distinguishable repurposed materials was weaker for participants with higher environmental concern.

[3] Conjoint analysis does not include main effects of variables that do not vary within each subject (such as environmental concern).

Table 4.5 Experimental effects when comparing repurposed to repurposed choices in Experiment 2 and 3.

Effect	Experiment	Odds Ratio[a]	95%CI	*p*
Function	2a	18.82	11.99, 29.55	**<.001**
	2b	27.23	16.07, 46.12	**<.001**
	3a	-	-	**-**
	3b	-	-	**-**
Distinguishability	2a	0.81	0.63, 1.05	.117
	2b	0.55	0.42, 0.73	**<.001**
	3a	0.58	0.45, 0.76	**<.001**
	3b	0.31	0.23, 0.42	**<.001**
Sustainability	2a	-	-	**-**
	2b	-	-	**-**
	3a	14.61	9.97, 21.82	**<.001**
	3b	18.19	11.75, 28.16	**<.001**
Environmental concern× Distinguishability	2a	0.78	0.59, 1.04	.096
	2b	1.39	1.11, 1.74	**.004**
	3a	1.03	0.78, 1.38	.817
	3b	1.34	1.03, 1.75	**.030**
Environmental concern× Sustainability	2a	-	-	**-**
	2b	-	-	**-**
	3a	1.35	0.89, 2.05	.152
	3b	1.54	1.13, 2.09	**.006**

Notes: a. Odds ratio above (below) 1 indicates participants are more likely to choose product on high (low) over low (high) condition.

4.4.3 Discussion

Experiment 2 replicated the main effect of function when comparing (1) a product made from repurposed materials to a product made from conventional materials; or (2) two products made from repurposed materials. The positive correlation between environmental concern and perceived sustainability difference between repurposed and conventional materials suggests that consumers with higher environmental concern are more sensitive towards perceiving the sustainability of materials. This might explain why consumers with higher environmental concern appeared more likely to sacrifice function for sustainability. This raises the question how the trade-off between function and sustainability unfolds when the sustainability attribute is explicitly communicated. It also seems that consumers with higher environmental concern care less about whether repurposed materials are distinguishable. Experiment 3 further examines whether this is the case when the sustainability attribute is explicitly communicated.

4.5 Experiment 3

In Experiments 1 and 2, the sustainability attribute of repurposed materials was implicit. Experiment 3 extended the findings to a situation where the sustainability attribute is explicitly mentioned for backpacks (3a) and T-shirts (3b).

4.5.1 Method

Participants and design

Each experiment recruited 100 participants (3a: N = 100, M_{age} = 29.23, SD = 10.85, 69% females; 3b: N = 100, M_{age} = 36.40, SD = 10.06, 51% females). Experiment 3 applied a nine-conditions within-subject design, consisting of 2 (function: high vs. low) × 2 (distinguishability: high vs. low) × 2 (sustainability: high vs. low) experimental conditions for the repurposed materials, and a control condition with conventional materials.

Stimuli

Experiment 3a/3b used the same stimuli and manipulations as experiment 2a/2b. In addition, the sustainability of materials was described as “raw material and chemicals used in production” in 3a, and “water use in planting and chemicals use in production” in 3b. In 3a, the high [low] sustainability read “plant-based by-products; *mild [aggressive]* chemicals used”, and the control condition read “animal hides; aggressive chemicals used”. In 3b, the high [low] sustainability read “rainfall and a small amount of irrigated water; *mild [aggressive]* chemicals used”, and the control condition read “a large amount of irrigated water; aggressive chemicals used”.

The nine conditions were converted to product profiles (Figure 4.4). We created 14 choice sets of two products: eight choices between each product from the full factorial design with the repurposed material and a product made from conventional material (experimental vs. control), and six (out of all 28 possible) choices between two products made from repurposed material for which the function was low. We limited the experiment to 14 choices to reduce participant fatigue. As the effect of low versus high function was robust across experiments 1 and 2, we did not prioritise further replication. See specific comparisons in Table H, Appendix H.

	Brand A	Brand J	Brand E	Brand G
Material	Pineapple leaf fibres as a leather alternative	Real leather	Pineapple leaf fibres as a leather alternative	Pineapple leaf fibres as a leather alternative
Withstanding: abrasion color fading seam rupture	As good as real leather	Good	Not as good as real leather	Not as good as real leather
Material appearance	Unique compared to real leather	No different than other leather	Unique compared to real leather	Very much like real leather
Raw material and chemicals use in production	Plant-based by-products mild chemicals used	Animal hides aggressive chemicals used	Plant-based by-products mild chemicals used	Plant-based by-products mild chemicals used

	Brand A	Brand J	Brand E	Brand G
Material	Bamboo fibres as cotton alternative	Cotton fibres	Bamboo fibres as cotton alternative	Bamboo fibres as cotton alternative
Durability Softness Washability Breathability	As good as Cotton fibres	Good	Not as good as Cotton fibres	Not as good as Cotton fibres
Material appearance	Unique compared to cotton fabrics	No different from other cotton fabrics	Unique compared to cotton fabrics	Very much like cotton fabrics
Water use in planting and chemicals use in production	Rainfall Mild chemicals used	A large amount of irrigated water Aggressive chemicals used	Rainfall Mild chemicals used	Rainfall Mild chemicals used

Figure 4.4 Examples of choices comparing repurposed to conventional material (left) and two repurposed materials (right) in 3a (top) and 3b (bottom).

Measures

The measures for environmental concern and the manipulation check of function and distinguishability[4] were identical to experiment 1. The sustainability manipulation check was measured with "I perceive this backpack/T-shirt as sustainable" on a 7-point Likert scale (1: "strongly disagree", 7: "strongly agree"). Product choice was the main outcome.

Procedure

Participants read a scenario in which they had plans to buy a product from a selection of nine new backpacks (3a) or new T-shirts (3b). They then made 14 choices. After the choice task, participants saw three individual products in random order, including the product made from the conventional material and two products made from repurposed materials that differed on each attribute. See the attribute conditions of two products made from repurposed materials in Table I1, Appendix I. For each product, they assessed the perceived function, distinguishability, and sustainability. Participants concluded the experiment by providing their demographic information (age, gender) and environmental concern.

4.5.2 Results

Manipulation check

Paired sample t-tests showed that the manipulation of the three attributes was successful in both experiments: participants perceived the product in the high condition to have a better quality, to look different, and to be more sustainable than the product in the low condition (Table 4.1). In 3a, the function in the control condition was perceived to be higher than the function in the high and low conditions. In both experiments participants perceived the product in the low condition to look different and to be more sustainable than the product in the control condition. See the specific results of each comparison in the manipulation check of experiment 3 in Table I2, Appendix I.

[4] Two-item measure of perceived distinguishability's Cronbach's α_{3a} = .93; α_{3b} = .93;

Comparing repurposed to conventional

The eight choices between repurposed and conventional materials were analysed with multilevel binary logistic regression. Next to the four predictors from experiment 2, sustainability and the interaction between sustainability and environmental concern were added as fixed effects (Table 4.3). This interaction was added, although not central to our research, as the effect of sustainability was expected to be larger for consumers with higher environmental concern. In both experiments, the intercept was above 1, indicating that in general participants chose repurposed over conventional materials (Figure 4.3). Main effects of function and sustainability were significant: participants were more likely to choose repurposed than conventional materials with a high function or sustainability. The main effect of distinguishability was only significant in 3a: participants were more likely to choose low rather than highly distinguishable repurposed materials over conventional materials. Participants with higher environmental concern were more likely to choose repurposed over conventional materials. The interaction between distinguishability and environmental concern was not significant. The interaction between sustainability and environmental concern was significant in 3a, indicating that the effect of sustainability was stronger for participants with higher environmental concern.

Two trade-off effects were explored for the four choices in which the repurposed materials with a low function were compared to conventional materials. As the repurposed materials in both high and low sustainability conditions were manipulated to be more sustainable than conventional materials, we marginalized the high and low conditions in sustainability before analysing the trade-off effects.

The trade-off effect between function and distinguishability was analysed with multilevel binomial logistic regression with distinguishability as fixed effect and participants as random intercept. Results showed that distinguishability influenced choices in 3a but not 3b: changing from low to high distinguishability, the chance to choose repurposed over conventional materials decreased (OR_{3a}= 0.28, 95%CI = [0.11,0.74], p = .01; OR_{3b} = 1.00, 95%CI = [0.55, 1.81], p = .993). Thus, participants were more likely to trade high function in favour of low rather than high distinguishability.

We marginalized the high and low conditions in distinguishability to analyse the trade-off between function and sustainability. In the binomial logistic regression, environmental concern was the predictor (Table 4.4). Both experiments showed that the intercept odds ratio was above 1, indicating that participants were more likely to choose repurposed over conventional products. Thus, participants tended to trade high function for explicit sustainability. The environmental concern odds ratio was above 1, indicating that the effect of trading function for sustainability was stronger for participants with higher environmental concern.

Comparing repurposed to repurposed

A logistic regression (conjoint analysis) with distinguishability, sustainability, and their two-way interactions with environmental concern predicted the choice likelihood in the six choices between products with the same repurposed material. The main effects of sustainability and distinguishability were significant (Table 4.5): the more sustainable and low distinguishable option was chosen more frequently. Two-way interactions between environmental concern and distinguishability, sustainability were only significant in 3b. For participants with higher environmental concern, the preference of low over high distinguishability was weaker, and the preference of high over low sustainability was stronger.

4.5.3 Discussion

Experiment 3 confirms that function and sustainability attributes affect consumers' preferences for fashion products made from repurposed materials. When sustainability information is added, sustainability becomes dominant in the trade-off between function and sustainability. Moreover, consumers seem to prefer low over highly distinguishable repurposed materials. The trade-off between function and distinguishability in 3a contradicts the prediction of costly signalling theory: participants were more likely to trade high function in favour of low rather than high distinguishability.

4.6 Discussion

Consistent across three experiments, we show that consumers are more positive to fashion products made from repurposed materials when the function of repurposed materials is equivalent to that of conventional materials. This finding adds to previous research demonstrating that consumers attach importance to product function and the fulfilment of a "necessary" function level when making product choices (Chitturi et al., 2007; Kivetz & Simonson, 2002).

The current findings also show that improving sustainability in repurposed materials increases the chance of consumers choosing such products. This is in line with research on different types of products that has shown that perceived sustainable benefits are positively associated with consumer preferences for such products (Magnier et al., 2019; Majer et al., 2022). When sustainability comes with a reduced function, the situation becomes more complex. Our findings regarding the trade-off between function and sustainability reveal that when consumers receive information that fashion products made from repurposed materials are sustainable, they are willing to sacrifice function for sustainability (Experiment 3). When consumers do not receive such information, they are less likely to sacrifice function for sustainability (Experiment 2), which is in line with previous findings on the trade-off between function and sustainability in different types of products, such as electronic products, where the sustainability advantage is explicitly presented to consumers (Luchs et al., 2012; Luchs & Kumar, 2017). Nevertheless, our findings show that even without sustainability information presenting, consumers perceive repurposed materials as more sustainable than conventional materials, which might imply that consumers are aware of the sustainability advantage of repurposed materials. It seems that providing information on the sustainability for inherently sustainable products (e.g., pineapple leaf backpacks) may work differently compared to providing such information for products in which sustainability is not intrinsic to the product (e.g., electronic products). Future research is needed to examine the interplay between sustainability information and the sustainable nature of products.

Our findings suggest that in general consumers prefer that repurposed materials are not visually distinguishable from conventional materials. The trade-off between function and distinguishability does not show consistent results. Consumers are more likely to sacrifice the function to attain low distinguishability only in one out of four studies with such trade-off choices. Nevertheless, the main effect of distinguishability and the trade-off between function and distinguishability both indicate consumers' preference for low distinguishability. This preference for low distinguishability contradicts previous findings on the role of observability in sustainable consumption, showing that consumers respond more favourably to sustainable products which are highly recognisable (Brick et al., 2017; Magnier et al., 2019). Our findings suggest that consumers may want to avoid to signal sustainability. In addition, we found that this tendency was more likely in consumers with lower environmental concerns. Consumers with greater environmental concerns are less likely to care whether the material is distinguishable. This explanation corroborates the finding of van Dam and Fischer (2015) that consumers tend to purchase sustainable products to establish and confirm their pro-environmental identity, regardless of visual conspicuousness.

The current research provides two practical suggestions for marketers and designers. The current findings suggest that the function and sustainability attributes positively influence consumer perceptions of and responses to products made from repurposed materials. Therefore, marketers might be able to promote fashion products made from repurposed materials by emphasizing the superior function and sustainability of the used materials. Also, our results reveal that consumers in general prefer repurposed materials that are not distinguishable from conventional materials. Based on this finding, designers may want to make repurposed materials less visually distinguishable from conventional materials by mimicking the texture or appearance of conventional materials.

A limitation should be taken into consideration is that the findings for distinguishability are based on text descriptions. Although these manipulations were successful, it may be difficult for some consumers to imagine what distinguishable repurposed materials would look like. Consequently, it may be possible that consumers preferred the low distinguishable repurposed materials because they were more familiar with the anticipated looks of conventional materials. We did examine distinguishability using pictures of material samples in our first experiment, but such pictures may not suffice to get a clear idea of what the final product will look like; future research on how finalised products would look like is necessary to examine the distinguishability aspect further.

In conclusion, the current research reveals how function, sustainability and distinguishability are relevant in consumers' product evaluations and choices for fashion products made from repurposed materials. More specifically, for consumers to be favourable towards fashion products made from repurposed materials, the functional performance of such products should be as good as that of similar products made from conventional materials, and the sustainability advantage should be explicitly presented to consumers. For consumers with low concerns for environmental consequences, the texture or appearance of repurposed materials should visually not be distinguishable from those of conventional materials

Chapter 5

General discussion

5.1 Summary of findings

The main research question of the current thesis is, "*How do consumers respond to fashion products made from repurposed materials?*". The thesis investigates various types of consumer responses (i.e., product evaluations, the need for product information, emotions, product choices) to fashion products made from repurposed materials. The thesis starts with proposing that three change occurring in material replacement may evoke different consumer psychological processes that have been commonly studied in consumer research. By studying various consumer responses to fashion products made from repurposed materials within which these changes are involved, the thesis attempts to infer psychological processes to explain consumer responses to fashion products made from repurposed materials and develop theoretical and practical implications.

Chapter 2 studied the effects of changing the purpose of the material to a new purpose as fashion material on consumers' evaluations of fashion products. Consumers might perceive a mismatch between the original purpose of repurposed materials and their new purpose as fashion materials. When applying the rationale of schema congruity theory (Meyers-Levy & Tybout, 1989), resolving this mismatch could be a candidate for the psychological process that predicts consumers' evaluations of fashion products made from repurposed materials. Chapter 2 thus examined *whether the inverted U shape relationship between incongruity perceptions and product evaluations predicted by schema congruity theory can be applied to fashion products made from repurposed materials*.

The findings of chapter 2 did not support the predictions of schema congruity theory (Meyers-Levy & Tybout, 1989). Although repurposed materials evoked stronger incongruity perceptions than conventional materials, none of the five studies showed the inverted U shape relationship between perceived incongruity and product evaluation. The findings consistently showed that a subgroup of consumers evaluated congruent products more positively than incongruent ones, which contradicts with the inverted U shape relationship that schema congruity theory predicts. Hence schema congruity theory might not apply to consumer responses to fashion products made from repurposed materials. Chapter 2 also investigated why consumers perceived repurposed materials as more incongruent than conventional materials. The findings indicated that the main reason was that repurposed materials in fashion products were perceived as less able to fulfil the product's function. This finding suggests that perceptions of whether repurposed materials can fulfil the main function of the products could play an important role in influencing consumers' incongruity perceptions of the products.

Given that chapter 2 showed that product incongruity was likely not relevant to predict consumer responses to fashion products made from repurposed materials, chapter 3 extended incongruity to a broader concept: atypicality. That is, incongruity might be one "type" of atypicality. Fashion products made from repurposed materials might evoke atypicality perceptions because of other reasons. A prominent example is the change in exposure frequency that consumers encounter fashion products made from repurposed materials. Previous research indicated that lower exposure frequency could evoke atypicality perceptions in products (Loken & Ward, 1990). Exposure frequency and product incongruity could be different factors to evoke atypicality perceptions in products. Thus, distinctive factors that can predict atypicality perceptions might exist. Chapter 3 explored consumer responses to fashion products made from repurposed materials by asking the question, *what factors can predict atypicality perceptions of products in general and fashion products made from repurposed materials, and how these factors are associated with consumers' need for different information and emotions towards the products*.

The findings of chapter 3 answered this question by revealing nine unique factors predicting atypicality perceptions across different products. Two distinguishable patterns appeared when analysing associations across these nine factors and consumer responses to various products. First, when consumers needed information about product benefits, they were likely to experience negative emotions towards the products. Second, when consumers understood product benefits, they would likely experience positive emotions and need for information about product accessibility. Chapter 3 also provided findings specifically for fashion products made from repurposed materials. The results showed that consumers' atypicality perceptions were mainly predicted by their uncertainty about whether repurposed materials can satisfy the required functional performance of fashion products (e.g., softness for T-shirts, sturdiness for backpacks) and whether repurposed materials are more sustainable than conventional materials. The uncertainty consumers experienced about the functional performance of fashion products made from repurposed materials found in chapter 3 further supported the findings of chapter 2 which showed that the functional performance is essential to predict either incongruity or atypicality perceptions.

Given that chapter 3 revealed that consumers were uncertain about the function and sustainability of fashion products made from repurposed materials, I inferred that the change in product attributes when replacing conventional materials with repurposed materials may influence consumer responses to fashion products made from repurposed materials. Thus, chapter 4 investigated the effects of the change of product attributes on consumer responses to fashion products made from repurposed materials. Based on the innovation diffusion framework (Rogers, 2004) and the findings from chapter 3, I selected three specific attributes in fashion products made from repurposed materials: function, sustainability, and distinguishability. Chapter 4 answered the research question of *how function, sustainability, and distinguishability product attributes and their trade-offs influence evaluations and choices of fashion products made from repurposed and conventional materials.*

The findings of chapter 4 showed that the function and sustainability attributes of fashion products made from repurposed materials played important roles in influencing consumers' product evaluations and choices. It appeared that consumers preferred a product made from repurposed materials to a product made from conventional materials when the function of products made from repurposed materials was as good as that of products made from conventional materials. This finding emphasizes the importance of product function in consumers' evaluations of and choices for fashion products made from repurposed materials. Consumers generally preferred more sustainable products made from repurposed materials compared to less sustainable products made from conventional materials. When the sustainability attribute of repurposed materials was explicitly presented compared to not explicitly presented, consumers were more likely to trade function for sustainability. Consumers preferred products made repurposed materials over those made from conventional materials, even when repurposed materials had an inferior functional performance compared to conventional materials. The effect of the distinguishability attribute was smaller than that of the function and sustainability attributes. Both the main effect of distinguishability and the trade-off between distinguishability and function showed that consumers preferred less distinguishable repurposed materials over highly distinguishable repurposed materials.

5.2 Theoretical implications

Based on the findings of the three empirical chapters, the current thesis provides insights into which psychological processes might occur when consumers respond to fashion products made from repurposed materials. Chapter 2 focused on examining whether resolving incongruity can be one of the underlying psychological processes when consumers encounter fashion products made from repurposed materials. Schema congruity theory argues that consumers need to devote some cognitive effort and deliberation to resolve an incongruity in products, and this process would then evoke positive or negative affective states, leading to positive or negative evaluations of the products (Meyers-Levy & Tybout, 1989; Peracchio & Tybout, 1996). Chapter 2 found that, although consumers perceived different levels of incongruity perceptions in repurposed and conventional materials, incongruity perceptions were not associated with evaluations of products made from different materials. Therefore, evidence from chapter 2 did not support the process of resolving the incongruity when consumers respond to fashion products made from repurposed materials.

The current thesis proposes a psychological process that differs from resolving incongruity when consumers perceive repurposed materials to be incongruent with the fashion product category. Both chapters 2 and 4 found that some consumers consistently evaluated products made from repurposed materials as more negative than products made from conventional materials. This finding suggests that some consumers might not devote cognitive efforts to resolving the incongruity perceptions that are evoked by repurposed materials in fashion products. Instead, these consumers may evaluate the products based on whether the products' materials are easy to process. According to processing influence theory, a stimulus that is easier to process evokes more positive affect, leading to more positive evaluations of that stimulus (Reber et al., 2004). Compared to repurposed materials, conventional materials in fashion products are easier to process because conventional materials are already stored in the product category. This could be why products made from conventional materials were evaluated more positively than those made from repurposed materials. The processing fluency explanation is in line with the previous finding that consumers with lower motivations to resolve incongruity perceptions have more positive evaluations of less incongruent products (Maoz & Tybout, 2002). The thesis thus suggests that some consumers are less likely to devote effort to resolving incongruity perceptions evoked by repurposed materials but instead evaluate the products more negatively when they find repurposed materials are not easy to process.

Chapters 2 and 4 also suggest that concern about environmental issues could be a possible characteristic of consumers who are less likely to devote effort to resolving incongruity perceptions evoked by repurposed materials. Consumers who care less about environmental issues might show less interest in repurposed materials, which explains why they are less likely to devote cognitive effort to resolving the incongruity evoked by repurposed materials. Thus, consumers who care less about environmental issues would evaluate fashion products made from conventional materials as more favourable than those made from repurposed materials. For consumers who care more about the environment, chapter 4 indicated that they preferred fashion products made from repurposed materials more than consumers who cared less about the environment. These findings could be explained by schema congruity theory arguing that consumers who care more about the environment devote more effort to resolving the incongruity evoked by repurposed materials, leading to higher evaluations of products made from repurposed materials. The alternative explanation is that consumers who care more about the environment prefer the more sustainable option. Moreover, chapter 2 did not show there was a group of consumers preferred fashion products made from repurposed materials. Future research is needed to examine which processes consumers with stronger environmental concerns use when encountering fashion products made from repurposed materials.

While chapter 2 focused on the process of resolving incongruity perceptions evoked by repurposed materials in fashion products, chapter 3 extended the research from incongruity perceptions to atypicality perceptions. As a broader concept than incongruity perceptions, atypicality perceptions can be evoked not only by a mismatch between the product/attribute and the product category, but also other factors. Chapter 3 identifies nine factors that can predict consumers' atypicality perceptions of various new products from different product categories. These nine factors, such as incongruity and exposure frequency, and their associations with the need for information and emotions imply that different psychological processes to interpret atypicality could occur when consumers encounter new products. For fashion products made from repurposed materials, chapter 2 showed that consumers may not attempt to resolve incongruity perceptions. Instead, chapter 3 showed that consumers are more likely to focus on two product attributes: the functional performance and sustainability benefits of such products. Identifying these two specific product attributes inspired the topic of chapter 4.

Based on chapter 3 that identified two crucial product attributes consumers would concern when encountering fashion products made from repurposed materials, chapter 4 examined consumer choices between fashion products made from repurposed materials and those made from conventional materials. This way I aimed to infer the process of how consumers trade off values between product attributes, function, sustainability. Chapter 4 replicated the previous finding that consumers prioritise the functional performance until a satisfactory threshold level of the functional performance is achieved (Luchs et al., 2012). The current thesis infers that consumers are more likely to sacrifice the function benefit for the sustainability benefit when the functional performance of repurposed materials is as good as that of conventional ones.

Moreover, chapter 4 extended the trade-off effect between function and sustainability from previous research (Luchs et al., 2012) by adding another important attribute to the trade-offs for fashion products made from repurposed materials: observability. It is important to consider the observability of the products when studying the trade-off effect between function and sustainability. Costly signalling theory argues that consumers are more likely to sacrifice superior function for superior sustainability when the superior sustainability is observable to other people (Griskevicius et al., 2010). The observability attribute, in the case of fashion products made from repurposed materials, was reflected by the appearance and texture of repurposed materials. The appearance and texture of repurposed materials can either be distinguishable from or similar to conventional materials. Chapter 4 showed that consumers were more likely to sacrifice superior function for superior sustainability when repurposed materials were not distinguishable from conventional materials. This finding contradicted the prediction of costly signally theory. It supported the argument that consumers behave pro-environmentally (e.g., buying sustainable products) to establish their self-identity, regardless of whether the sustainability benefits are visible to others (Griskevicius et al., 2010). Therefore, consumers' preference of less distinguishable repurposed materials may indicate that consumers chose a more sustainable option because they would establish their self-identity of being sustainable. This implies that consumers might need less external signals to establish their sustainability identity, which was discovered by the previous research showing that messages that are too explicitly convey identity could decrease purchase likelihood (Bhattacharjee et al., 2014).

5.3 Practical implications

The current thesis provides several practical implications for marketers, designers and producers of fashion products made from repurposed materials. First, the findings from all empirical chapters suggest that marketers need to emphasise the function of fashion products made from repurposed materials to be at least as good as those with conventional materials. Across three empirical chapters, the current thesis emphasizes the importance of consumers' perceptions of product function in fashion products made from repurposed materials (chapters 2 and 4) and in various products across different product categories (chapter 3). Perceived inferior functions in fashion products made from repurposed materials, such as softness in T-shirts or sturdiness in backpacks, can evoke incongruity perceptions (chapter 2), can cause lower consumer evaluations, and can decrease the choices of such products (chapter 4). Consumers' doubt about the product function was associated with negative emotions towards the products (chapter 3). These findings are in line with previous research showing that, when choosing between a product with a superior functional performance and a product with another superior attribute, such as sustainability, consumers tend to attach more value to the product's functional performance until it achieves a satisfactory threshold level (Chitturi et al., 2008; Luchs et al., 2012). In the case of fashion products made from repurposed materials, although new techniques can significantly enhance the functional performance of products made from repurposed materials, consumers need to perceive the functional performance of products made from repurposed materials to be at the same level as those made from conventional materials. Therefore, emphasizing that the function performance of fashion products made from repurposed materials can be as good as the function performance of fashion products made from conventional materials could be a promising strategy for marketers.

Although repurposed materials are less resource-intensive and polluting compared to conventional materials (Hazarika et al., 2017; Jones et al., 2021; Ribul et al., 2021), chapter 3 showed that consumers can still be uncertain about the sustainability benefit of repurposed materials. Chapter 4 found that explicitly presenting the sustainability benefits of repurposed materials can increase the likelihood that consumers choose a fashion product made from repurposed materials over that made from conventional materials, compared to a situation where the sustainability benefits of repurposed materials are absent. The finding from chapter 4 suggests that simply displaying, for example, how much water it can save and to what degree pollution is avoided when producing pineapple leaf backpacks compared to leather backpacks can work well. Therefore, a practical solution to decrease consumers' uncertainty about the sustainability benefits of repurposed materials is to explicitly communicate the sustainability benefits of repurposed materials to consumers when advertising new fashion products made from repurposed materials.

To facilitate sustainable fashion, we should not only promote fashion products made from repurposed materials to consumers who care about the environment, but also increase the chance of buying such products among consumers who care less about the environment. The current thesis suggests that fashion designers may want to make the texture or appearance of repurposed materials look similar to that of conventional materials. This practical suggestion is based on the findings of Chapters 2 and 4, which suggest that consumers' environmental concerns could play a role in consumers' preference for fashion products made from conventional materials. Making repurposed materials less distinguishable from conventional materials for fashion products may increase the chance of buying such products among consumers who care less about the environment. One requirement for this suggestion to work is that consumers perceive the functional performance of products made from repurposed materials to be as good as those of products made from conventional materials. Chapter 4 did not find evidence showing that making repurposed materials less distinguishable from conventional materials influenced preferences for repurposed materials among consumers who care about the environment. Therefore, making the texture or appearance of repurposed materials look similar to conventional materials could be a worthy strategy for manufacturers and designers of fashion products made from repurposed materials to gain both consumers who care and who care less about the environment.

5.4 Methodological reflections

The current thesis can provide some insights into the methodological design of research projects that are focused on a specific product/innovation. To conduct a four-year research project centred around a specific product, I faced the question of which theory I should apply to study this specific product. The most salient change in fashion products made from repurposed materials could be the material change. I considered that schema congruity theory, which focuses on incongruity perceptions (evoked by material change), might provide a sound prediction of how consumers would evaluate fashion products made from repurposed materials because of its broad adoption in marketing. Therefore, in the first empirical chapter I conducted five experimental studies aiming to identifying the inverted U shape relationships between incongruity perceptions and product evaluations by using fashion products with various repurposed and conventional materials as stimuli. Although chapter 2 showed that repurposed materials evoke incongruity perceptions compared to conventional materials, incongruity perceptions did not influence evaluations of fashion products made from repurposed materials in an inverted U shape style as what schema congruity theory would predict. In chapter 2, by selecting a theory as a starting point, I began my empirical research from the deduction of what the most prominent theory in the field predicts for such products. When confronted with null findings, tweaking product descriptions and experimental manipulations might be relevant to rigorously examine the theory, but it can be detached from what matters for the application of the product in hand in the real world (Lynch et al., 2012). In my case, resolving incongruity could be the essential process when consumers encounter repurposed materials in the specific experimental settings, but consumers have many other considerations when they actually encounter fashion products made from repurposed materials in a store.

With chapter 2 failing to support the schema congruity theory, I faced three options for the next step in the project. The first option was to explore potential boundary conditions under which schema congruity theory could be applied to fashion products made from repurposed materials. The first option could lead the current thesis to focus entirely on the examination of schema congruity theory. If the topic of this dissertation would be the validation of that specific theory, this would be a relevant approach. However, given that the main aim of the current thesis was to provide insights into relevant psychological processes underlying consumer responses to products made from repurposed materials in the real world, finetuning studies to one theory may not solve the issue on what matters in the real world. The second option was to try a different theory to examine how consumers respond to fashion products made from repurposed materials. By choosing the second option, I would then face the same risk of choosing another theory which might not work well for fashion products made from repurposed materials. The third option was to explore the possibilities based on the findings of chapter 2, beyond schema congruity theory, before selecting a new approach.

Chapter 3 used such an exploratory approach. Here I “zoomed-out” from the findings of chapter 2, which focuses on one specific theory, to examine the different theories that relate to how consumers respond to a wide range of new products. Specifically, chapter 3 extended beyond the psychological process of resolving incongruity to multiple psychological processes related to the broader concept of atypicality. The findings in chapter 2 imply that incongruity perceptions might be just one reason for why consumers consider a product to be atypical. Different theories other than schema congruity theory could predict atypicality perceptions in fashion products made from repurposed materials, influencing consumer responses to such products. Therefore, chapter 3 attempted to identify factors that predict atypicality perceptions in fashion products made from repurposed materials. By knowing potential factors that predict atypicality perceptions in fashion products made from repurposed materials, chapter 4 selected the most salient one and zoomed back in again using a different approach compared to chapter 2.

Thus, the current thesis started with examining a specific theory applied to the target product (chapter 2), then zoomed out to further explore possible directions based on the findings from the first empirical study (chapter 3), and finally zoomed in again to examine a different theory supported by the second empirical study (chapter 4). Chapters 2, 3 and 4 together thus conducted a sequential mixed-method design. In this case, the first phase was a deduction-testing phase (chapter 2), followed by an evaluation-observation-induction phase (chapter 3), before moving back to a deduction-testing phase (chapter 4). Hence my design went through every stage: deduction-testing-evaluation-observation-induction, then close the empirical cycle by again going through deduction to testing (Fischer & Reinders, 2022; Lynch et al., 2012). In doing so, I combined the less frequently used explanatory mixed methods (Bekker et al., 2021; van Dijk et al., 2017) with the more frequently applied exploratory mixed method (Cruz-Cárdenas et al., 2019; Tran et al., 2022). I argue that this more extensive mixed-method approach is relevant when researchers fail to confirm something they expect to be the foundation of the project in their first few trials, which might occur during a long-term project focusing on a specific innovation.

5.5 Limitations and future work

The current thesis discusses three limitations and proposes their corresponding future research. One limitation of the current thesis is that consumer responses to the selected repurposed materials might require more work to generalize to other repurposed materials. Various materials can fall under the concept of repurposing and these materials may have multiple different properties. For example, the naturalness of materials (e.g., natural pineapple leaves versus artificial plastic bottles) could be an important factor influencing consumer responses to the products (Rozin, 2005). At the same time, both natural pineapple leaves and artificial plastic bottles can be considered to be repurposed materials. In chapter 2, the results suggested that material naturalness did not influence consumers' evaluations of fashion products. Chapter 4 only used natural repurposed and conventional materials as stimuli, and was therefore unable to further delve into the role of naturalness in consumers' product choices between, for example, fashion products made from artificial repurposed materials to that made from natural conventional materials. Future research might examine the effect of naturalness and other product properties of repurposed materials on consumers' product choices for (fashion) products made from repurposed materials.

Chapter 2 attempted to contribute schema congruity theory by examining it at the individual level. However, the findings did not support schema congruity theory in evaluating fashion products made from repurposed materials and did not answer why the inverted U shape relation between incongruity perceptions and product evaluations did not show up in this specific case. One possible explanation can be inferred from the findings of chapter 3. Chapter 3 found that one factor predicting atypicality perceptions was that consumers did not understand how a particular product worked, and consumers were curious to learn this information. Different from the information that can be directly useful to make purchase decisions (e.g., information about product benefits and how to use the product), the information about how the product works could not be directly relevant for decision making. Merely learning this information that is irrelevant for decision making may satisfy consumers' curiosity and thus be rewarding (van Lieshout et al., 2019). Schema congruity theory argues that consumers can be curious to resolve product incongruity, and successfully resolving the product incongruity could satisfy consumers' curiosity, leading to positive affect states and positive product evaluations (Daume & Hüttl-Maack, 2019). Future research should explore what information consumers are curious to learn and whether the "usefulness" of information plays a role in influencing consumers' affect states and product evaluations.

As a final limitation, the current thesis does not cover one important attribute of fashion products: the aesthetic design of these products. To be able to reliably examine the role of repurposed materials in consumer responses, I attempted to exclude the influence of aesthetic design as much as possible when studying the effect of repurposed materials on consumer responses. Individual differences in aesthetic taste may influence consumers' evaluations of and choices for fashion products, thereby affecting the role of repurposed materials in product evaluations and choices. Therefore, the current thesis used pictures of common-looking T-shirts, shoes and backpacks in chapter 2, and avoided the use of pictures of fashion products in chapter 4 to remove the influence of individual differences in aesthetic taste on consumer responses to fashion products made from repurposed materials.

Nevertheless, aesthetic design is an unavoidable topic when studying fashion products (Creusen & Schoormans, 2005). For example, previous research has shown that aesthetic design can influence consumers' perceptions of product functional performance, consequently influencing the trade-off between function and sustainability on cell phones (Luchs et al., 2012). Future research can investigate the interplay between aesthetic design and the use of materials in consumer responses to fashion products made from repurposed materials.

5.6 Conclusion

Based on the findings of three empirical chapters, the thesis infers several psychological processes that could and could not explain how consumers respond to fashion products made from repurposed materials. The thesis proposes that consumers' atypicality perceptions of fashion products made from repurposed materials mainly come from their uncertainty about the functional performance and sustainability benefits of such products. Once consumers perceive the functional performance of repurposed ones is as good as conventional ones, and the sustainability benefits of repurposed materials are explicitly communicated to consumers, consumers are more likely to choose fashion products made from repurposed materials. Consumers also prefer the texture of repurposed materials to be similar to, instead of distinguishable from, conventional materials. This knowledge will help marketers and designers to facilitate sustainable fashion by understanding how consumers respond to such fashion.

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Appendices

Appendix A. Product stimuli of Chapter 2

Figure A Product stimuli
Note: All stimuli pictures were purchased from the stock image website (https://www.123rf.com/).

Appendix B. The results of the inverted U shape examination from between-subjects data from Chapter 2

Table B The average level relation between incongruity and product evaluation from between-subjects data

Study	Left slope	SE	95%CI	Centred break point	Right slope	SE	95%CI
1a	0.08	0.08	-0.08, 0.24	30.78	-0.35	0.35	-1.03, 0.36
1b	0.51	0.66	-0.75, 1.80	-26.76	0.09	0.07	-0.05, 0.23
2	0.02	0.07	-0.12, 0.16	29.12	-0.003	0.27	-0.53, 0.53
3a	0.14	0.11	-0.07, 0.36	26.25	-0.07	0.27	-0.61, 0.45
3b	0.30	0.18	-0.05, 0.66	11.31	-0.13	0.23	-0.59, 0.34

Note: Posterior distribution means, standard errors and 95% credible intervals of slope coefficients on left and right side of the break point.

Appendix C. The distribution of congruity perceptions from Chapter 2

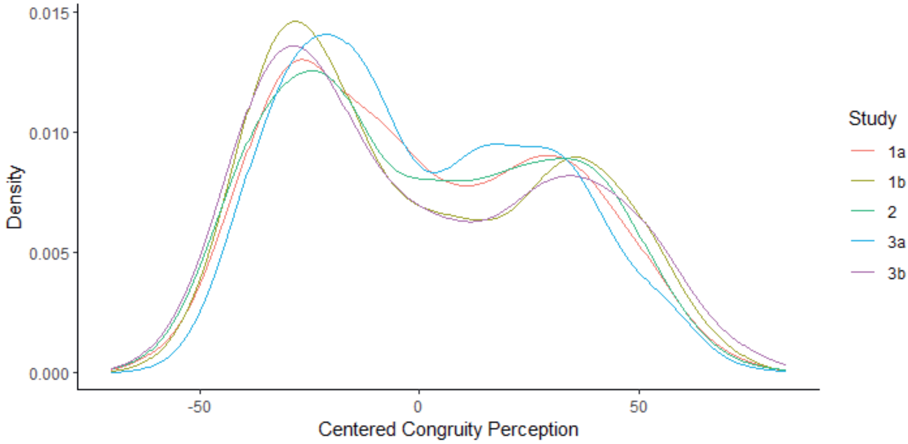

Figure C The distribution of congruity perception across five studies

Appendix D. Product codes in each group from Chapter 3

Table D Product codes in each group

Group number	15 products in each group
1	"a7" "a8" "a14" "f11" "f4" "f15" "w5" "w10" "e2" "e5" "h2" "h9" "s1" "t5" "t7"
2	"a6" "a3" "a10" "f10" "f6" "f5" "w8" "w2" "e4" "e8" "h8" "h6" "s3" "t4" "t9"
3	"a9" "a4" "a12" "f12" "f3" "f2" "w6" "w7" "e9" "e1" "h3" "h1" "s2" "t10" "t1"
4	"a2" "a11" "a13" "f7" "f13" "f1" "w1" "w9" "e6" "e3" "h7" "h4" "s5" "t6" "t8"
5	"a1" "a15" "a5" "f9" "f14" "f8" "w3" "w4" "e7" "e10" "h5" "h10" "s4" "t3" "t2"

Appendix E. Product descriptions from Chapter 3

Table E Product descriptions

Product code	Product name	Text description
a1	Starkey Livio AI	A hearing aid that amplifies the sound and translates conversations into users' native language. It also streams music, answers questions, detects falls and alerts others, and tracks daily activities such talking and physical movements.
a2	OrCam MyEye 2	A device that can be attached to the frame of any glasses. It identifies faces and currency, reads texts and information aloud.
a3	Xfinity X1 Eye Control	A web-page based remote device that is connected to an eye-gaze chasing machine. It allows users to control computers, tablets, and TVs by looking at different buttons on the webpage.
a4	Foldimate Laundry-Folding Machine	A machine that folds shirts, trousers and towels in about five seconds.
a5	iRobot Roomba i7+	A vacuum cleaner that can clean itself by sucking up the dirt and dust from its innards automatically.
a6	Grypmat	A toolbox that can stick to a bended surface without scratching it.
a7	Tile Smart Alerts	A tracker that reminds users that keys have been forgotten in a designated place (e.g., home or the gym).
a8	BenjiLock	A padlock that can be opened by either a key or fingerprints.
a9	Yubi Buff and Blend Set	A make-up tool that can be slid onto users' fingertips and offers the possibility to switch between a buff brush and a soft blending sponge.
a10	ThinkPad X1 Foldable	A laptop with a full screen and virtual keyboard. The full screen can be folded into half.
a11	Rabbit Charger Duo	An accessory that keeps regular wall outlet plugs available while offering a dual-device USB charger.
a12	Philips Somneo	An alarm clock that gradually rises its volume to wake up people and adjusts the lights to simulate a natural sunrise and sunset.
a13	KitchenAid Smart Oven+	An oven that can bake, steam and grill. It also provides instructions for recipes on its screen and can be remotely controlled with an app.
a14	Watergen GENNY	A machine that pulls moisture from air to create drinkable water by using either electricity or solar power. It also works in regions with air pollution.
a15	Simplehuman Sensor Can	A waste bin that opens and closes the lid by recognising people's voice or hand waving.
w1	B'zT	A children's t-shirt that contains a machine-washable tracking device. The device provides information about the location of the wearer.

w2	Solar Jacket	A solar charged jacket that releases green light in the dark.
w3	Bee & Kin Tech Handbags	A purse that can illuminate the interiors and connect to users' phone by Bluetooth to call Uber, navigate to a location, or start a playlist by pressing buttons at the inside edge of the purse.
w4	Mycelium Leather	A pair of sneakers that is made of mushroom leather.
w5	Denim Unspun	A jeans that fits individual consumers by using a 3D body scanner and allowing consumers to select the fabric, colour, and style of the jeans.
w6	FutureLight	A waterproof jacket that uses nano-spinning technology to be extra breathable.
w7	PUMA Fi	A shoe with computer processors that allow users to tighten or loosen the shoe with an app.
w8	Rothy's	Shoes that are made of plastic bottles.
w9	Harvey's Mini Bag	A bag that is made of recycled seat belts.
w10	Pinatex bag	A bag that is made of pineapple leaves.
f1	Black Rice	Rice that has a deep black colour and can be used for creating porridge, desserts, bread, and noodles.
f2	Apeel	An edible, plant-derived coating layer on the peel that slows the ripening process. It doubles the shelf life of fresh fruits and vegetables.
f3	M&M's	M&M's (chocolates) that are filled with hazelnut spread.
f4	Vlasic Chips	Chips that are made from vacuum fried, thinly sliced pickles.
f5	Bee Approved Vegan Organic Alternative to Honey	A honey alternative that is made from organic brown rice. It does not involve any bees.
f6	Other Foods Crunchy Oyster Mushroom Chips	Chips that are made from oyster mushrooms.
f7	Coca-Cola Energy	A cola that contains caffeine from natural sources, guarana extract and vitamins B3 and B6. It does not contain taurine.
f8	Bol Bang Bang Sweet Potato Katsu Curry	A ready-to-eat meal that uses wonky vegetables as ingredients.
f9	AKUA Kelp Jerky	A nutritious snack that is made of an underwater crop: kelp. Kelp pulls carbon from the water and thereby fights climate change.
f10	Impossible Burger	A beef alternative burger that chars and bleeds like ground beef. It is made entirely from plant-based proteins.
f11	Vita cup	A coffee that is fortified with vitamin A and D, omega-3 EPA, and DHA.
f12	Vitamin vodka	A sugarcane-based vodka that contains vitamins B and C.
f13	Rita carbonated coconut water	Coconut water that is carbonated and carries no colours or sugar.
f14	Vio	A bottle of beverage that combines carbonated milk with fruit flavours.

f15	Jeni's Splendid Ice Creams Dairy-Free Collection	An alternative ice cream that is made of coconuts (instead of dairy). The coconuts ensure the ice cream's creamy texture.
e1	Sony PS-LX310BT	A vinyl that streams music to wireless speakers.
e2	Hypersuit VR Simulator	A virtual reality simulator that includes a headset and a movable exoskeleton suit. It enables users to feel as if they carry out the behaviour actually, such as flying or diving.
e3	BeBop Sensors Forte Wireless Gloves	A pair of gloves that allows users to grab and manipulate digital objects in a 3D virtual reality space.
e4	Batband	An ear-free headphone that emits sound waves through the bones of the skull, delivering the sound to the inner ear while users can still hear sounds from other sources.
e5	Roli Lumi	A keyboard that colours the keys to be touched. This enables users to learn which keys to play.
e6	Remo Tech Obsbot Tail	A camera that follows the target automatically and that captures the target's movements in a 4K (3840×2160) resolution video.
e7	Google stadia	An online game platform that provides the possibility to play games without game downloads or updates on laptop, tablet, or phone.
e8	HTC Vive Pro Eye	A virtual reality headset that enables users to control the device with their eyes, without using their hands. It also increases the resolution of whatever users are looking at.
e9	LG CineBeam Laser 4K Projector	A portable projector that brings a cinematic viewing environment with a projection screen of up to 150 inches with 4k (3840×2160) resolution.
e10	Samsung QLED TV	A 4k (3840×2160) resolution TV that can blend into the room by mimicking the wall on which it is hanging.
h1	Eight Sleep Pod	A mattress that uses thin water channels to dynamically regulate its temperature throughout the night based on users' pre-sets and biometric feedback. It also measures sleep phases, heart rate, and respiratory rate to assess sleep quality.
h2	Welt The Smart Belt	A belt that tracks and monitors waist size, activities and sitting times.
h3	Zeeq Smart Pillow	A pillow that plays music and wakes up sleepers based on the user's movement patterns. It also has a snore alarm that nudges snorers into a new sleeping position when it detects snoring through a microphone.
h4	HabitAware Keen	A bracelet that detects repetitive motions, such as hair pulling, or nail biting. It vibrates to make users aware of their habits and to motivate change.
h5	Acuvue Oasys with Transitions	Contact lenses that correct vision and sense the amount of light entering eyes. The lenses darken or lighten automatically to maximize comfort.
h6	i-Blades Smartcase	A phone case that protects the phone from dropping, and that examines the air quality.

h7	Bose Sleepbuds	A pair of earbuds that fits inside the ear without jutting out and can play soothing sounds such as ocean waves or rustling leaves.
h8	Embr Wave	A bracelet that heats or cools the skin around the user's wrists. These actions can stimulate the brain to think that it is experiencing warmer or cooler temperatures.
h9	Hair Coach	A hairbrush that tracks the force and rhythm of users' brushing patterns to provide a hair quality score. It provides feedback to brushing habits, and personalized product recommendations.
h10	Black Toilet Paper	Black toilet paper that is made of biodegradable cotton and natural dyes.
s1	FightCamp	A pair of boxing gloves that tracks the volume, speed, and intensity of punches
s2	SmartHalo 2	A bicycle navigator that translates directions from your smartphone into colourful LED lights on the handlebars, and points the direction as a “compass” sign.
s3	Tonal Display	A screen that streams live workouts of users to trainers. It enables users to receive real-time feedback from trainers.
s4	Walnutt SPECTRA X	An electric skateboard that can accelerate to 30 km/h in 5 seconds and capture the rider's movement to adjust direction accordingly.
s5	Roam Robotics Elevate Robotic Ski Exoskeleton	A ski exoskeleton that eases knee pain as users go down the slopes by sending air pressure from the backpack to the knee brace(s).
t1	YETI Rambler Vacuum Insulated Tumbler	A mug that keeps beverages hot or cold for hours
t2	GY-014 Digital Luggage Scale	An electronic luggage scale that measures the weight of bag or suitcase.
t3	T-shirt	A t-shirt that is made of cotton.
t4	Omron HeartGuide	A watch that monitors the user's blood pressure, measures sleep quality, and the physical activities.
t5	VanMoof Electrified S2	An electric bicycle that can reach a top speed of 32 km/h and provide an extra boost of power to get up a hill. Its lock system employs a high-pitched alarm and can be unlocked by smartphone.
t6	Lay's Chips	A bag of potato chips that is paprika flavour.
t7	Nike Air Zoom Terra Kiger6	A pair of running shoes that is built to take on wet and rocky trails with lightweight. The unit in the heel provides extra cushioning.
t8	Philips Rice Cooker	A rice cooker that can automatically switch to the warm mode to keep rice or dishes warm when the cooking process is finished.
t9	Ikea Skarsta Sit/Stand Desk	A desk that allows users to lower and raise the height of the desk with a crank handle.
t10	QuietComfort 35 Wireless Headphones	A wireless headphone that clears away the noisy in the environment.

Appendix F Manipulation check results of Experiment 1 from Chapter 4

Table F Experiment 1 manipulation check: comparisons between conditions for each attribute.

Perceived attribute	Condition	Experi -ment	*t*	*df*	*p*	*Cohens' d*	95%CI
Function	High vs. low	1a	3.94	295.27	**<.001**	0.44	0.23, 0.64
		1b	4.89	306.07	**<.001**	0.55	0.33, 0.77
	High vs. control	1a	-2.83	151.39	**.018**	-0.33	-0.62, -0.06
		1b	0.74	160	**0.460**	0.10	-0.16, 0.37
	Control vs. low	1a	5.41	192.25	**<.001**	0.71	0.44, 1.00
		1b	3.43	187.09	**<.001**	0.46	0.20, 0.72
Distinguisha -bility	High vs. low	1a	0.72	316.48	.475	0.08	-0.13, 0.29
		1b	14.22	307.83	**<.001**	1.59	1.31, 1.92
	High vs. control	1a	3.11	160.14	**.002**	0.43	0.16, 0.72
		1b	17.70	129.51	**<.001**	2.52	2.12, 3.04
	Control vs. low	1a	-2.58	153.98	**.011**	-0.36	-0.63, -0.10
		1b	-6.72	149.63	**<.001**	-0.93	-1.27, -0.63

Note: some degrees of freedom are not integer because they are calculated by using Welch-Satterthwaite formula.

Appendix G Comparisons in Experiment 2 from Chapter 4

Table G Comparisons in Experiment 2

Comparison	Choice 1	Choice 2	Analysis
Repurposed (choice 1) vs Conventional (choice2)	High-High	Conventional	Repeated measure logistic regression
	High-Low	Conventional	
	Low-High	Conventional	
	Low-Low	Conventional	
Repurposed (choice 1) vs Repurposed (choice 2)	High-High	High-Low	Conjoint logit
	High-High	Low-High	
	High-High	Low-Low	
	High-Low	Low-High	
	High-Low	Low-Low	
	Low-High	Low-Low	

Note: In the repurposed materials' choice, the condition is always "function" (high or low)-"distinguishability" (high or low).

Appendix H Comparisons in Experiment 3 from Chapter 4

Table H Comparisons in Experiment 3

Comparison	Choice 1	Choice 2	Analysis
Repurposed (choice 1) vs Conventional (choice2)	High-High-High	Conventional	Repeated measure logistic regression
	High-High-Low	Conventional	
	High-Low-High	Conventional	
	High-Low-Low	Conventional	
	Low-High-High	Conventional	
	High-High-Low	Conventional	
	Low-Low-High	Conventional	
	Low-Low-Low	Conventional	
Repurposed (choice 1) vs Repurposed (choice 2)	Low-High-High	Low-High-Low	Conjoint logit
	Low-High-High	Low-Low-High	
	Low-High-High	Low-Low-Low	
	Low-High-Low	Low-Low-High	
	Low-High-Low	Low-Low-Low	
	Low-Low-High	Low-Low-Low	

Note: In the repurposed materials' choice, the condition is always "function" (high or low)- "distinguishability" (high or low)- "sustainability" (high or low).

Appendix I. Example stimuli and results of manipulation check of Experiment 3 from Chapter 4.

Table I1 Experiment 3 manipulation check setup of products made from repurposed materials

Group	Repurposed 1	Repurposed 2
1	High-High-High	Low-Low-Low
2	High-High-Low	Low-Low-High
3	High-Low-High	Low-High-High
4	High-Low-Low	Low-High-High

Note: In the repurposed materials' choice, the condition is always "function" (high or low)-"distinguishability" (high or low)- "sustainability" (high or low).

Table I2 Experiment 3 manipulation check: comparisons between conditions for each attribute.

Effect	Condition	Experiment	*t*	*df*	*p*	*Cohens' d*	95%CI
Function	High vs. low	3a	10.24	99	**<.001**	1.02	0.82, 1.26
		3b	8.27	99	**<.001**	0.83	0.55, 1.16
	High vs. control	3a	2.62	99	**.010**	0.26	0.06, 0.50
		3b	-0.26	99	.798	-0.03	-0.23, 0.17
	Control vs. low	3a	13.05	99	**<.001**	1.30	1.09, 1.62
		3b	7.90	99	**<.001**	0.79	0.55, 1.08
Distinguishability	High vs. low	3a	10.09	99	**<.001**	1.01	0.82, 1.24
		3b	4.72	99	**<.001**	0.47	0.28, 0.69
	High vs. control	3a	16.80	99	**<.001**	1.68	1.39. 2.08
		3b	10.03	99	**<.001**	1.00	0.82, 1.21
	Control vs. low	3a	-8.83	99	**<.001**	-0.88	-1.07, -0.72
		3b	5.19	99	**<.001**	-0.52	-0.77, -0.29
Sustaina-bility	High vs. low	3a	6.04	99	**<.001**	0.60	0.40, 0.83
		3b	7.45	99	**<.001**	0.75	0.58, 0.95
	High vs. control	3a	14.32	99	**<.001**	1.43	1.15, 1.43
		3b	13.59	99	**<.001**	1.36	1.07, 1.76
	Control vs. low	3a	-10.90	99	**<.001**	-1.09	-1.34, -0.88
		3b	-9.26	99	**<.001**	-0.93	-1.16, -0.72

Appendix J. Model comparisons in all analyses from Chapter 4.

Table J Model comparisons.

Compared models	Experiment (outcome)	χ^2 (df)	*p*
Tested: F + D + EC + D×EC Full: F + D + EC + D×EC + F×EC + F×D + F×D×EC	1a (evaluation)	χ^2 (3) = 8.49	**.04**[a]
	1a (willingness to buy)	χ^2 (3) = 10.85	**.01**[b]
	1b (evaluation)	χ^2 (3) = 3.02	.48
	1b (willingness to buy)	χ^2 (3) = 4.12	.43
	2a (repurpose vs. conventional)	χ^2 (3) = 1.50	.68
	2b (repurpose vs. conventional)	χ^2 (3) = 5.24	.16
Tested: F + D + D×EC Full: F + D + D×EC + F×EC + F×D + F×D×EC	2a (repurpose vs. repurpose)	χ^2 (3) = 1.25	.74
	2b (repurpose vs. repurpose)	χ^2 (3) = 2.77	.43
Tested: F + D + S + EC + D×EC + S×EC Full: F + D + S + EC + F×EC + D×EC + S×EC + F×D + D×S + F×S + F×D×EC + F×S×EC + D×S×EC + F×D×S + F×D×S×EC	3a (repurpose vs. conventional)	χ^2 (9) = 3.16	.96
	3b (repurpose vs. conventional)	χ^2 (9) = 8.62	.47
Tested: D + S + D×EC + S×EC Full: D + EC + D×EC + S×EC + D×S + D×S×EC	3a (repurpose vs. repurpose)	χ^2 (2) = 0.58	.75
	3b (repurpose vs. repurpose)	χ^2 (2) = 0.33	.85

Note. F: function; D: distinguishability; S: sustainability; EC: environmental concern. a, b: in the full model, F×EC was significant (1a: b = -0.25, SE = 0.11, p = .02; 1b: b = -0.34, SE = 0.13, p = .01), indicating that the function effect was weaker in participants with higher environmental concern.

Pre-registrations and data open access

Chapter 2

Pre-registration:

https://osf.io/w7c94/?view_only=1b30bfc2d7f7486dba98d7b724a7662e

Data and analysis scripts:

https://doi.org/10.17026/dans-xfv-46ea

Chapter 3

Data and analysis scripts:

https://doi.org/10.17026/dans-zk2-hrse

Chapter 4

Pre-registration:

https://osf.io/h4t6s/?view_only=fedf05597c4842cab8e8e6f8bc911d47

Data and analysis scripts:

https://doi.org/10.17026/dans-x7c-pyv9

Summary

The fashion industry has a profound, negative impact on the environment. One way to reduce this negative impact is to replace conventional materials with repurposed materials to produce fashion products. Repurposed materials can be defined as materials whose conventional uses are changed into new use. For example, pineapple leaves as agricultural waste can be repurposed into leather alternatives to produce backpacks and jackets. Compared to conventional materials currently used for fashion products, repurposed materials are less polluting, less resource-intensive, yet no more complicated to manufacture than conventional materials. Gradually replacing conventional materials with repurposed materials can thus have both environmental and commercial benefits for the supply chain.

Although replacing conventional materials with repurposed materials can be promising, it is uncertain whether fashion products made from repurposed materials will be successful. In this thesis, I investigate one essential factor for product success: consumer responses to such novel products. By studying consumer responses to fashion products made from repurposed materials, the thesis aims to infer different psychological processes which might play a role in how consumers respond to such products and thus to provide insights into marketing strategies and the implications for product designers.

This thesis starts by considering three substantial changes in fashion products when conventional materials are replaced with repurposed materials to make fashion products: (1) the material's purpose, (2) the product exposure frequency, and (3) the product attributes. The thesis studies various consumer responses to these three changes, such as product evaluations, the need for product information, product choices. Chapter 1 discussed how these consumer responses to the three changes could reflect different psychological processes that explain and predict consumer responses to fashion products made from repurposed materials.

Chapter 2 investigated how the change of the material's purpose influences consumers' evaluations of fashion products. The change of the material's purpose might evoke mismatch perceptions between the original purpose of repurposed materials (e.g., pineapple leaves as agricultural waste) and their new purpose as fashion materials. According to schema congruity theory, successfully resolving the mismatch could increase evaluations of the target products, and failure could decrease evaluations of the target products. Whether success or failure to resolve

the mismatch depends on how big the mismatch consumers perceive: when the mismatch is too big to resolve, they might fail; when the mismatch is too small, consumers might feel bored. Consumers' evaluations tend to increase only when a "proper" amount of the mismatch appears and consumers resolve it. Chapter 2 conducted multiple experiments to examine whether schema congruity theory can be applied to consumers' evaluations of fashion products made from repurposed materials.

While Chapter 2 focused on testing one specific process, Chapter 3 extended the research from incongruity to atypicality perceptions in fashion products made from repurposed materials. As a broader concept than incongruity perceptions, atypicality perceptions can be evoked by not only the mismatch between the product and the product category but also other factors, such as the frequency that consumers encounter the product. Chapter 3 identified salient factors that predicted atypicality perceptions in fashion products made from repurposed materials by exploring why consumers consider various products as atypical in a qualitative study. The findings of Chapter 3 inspired the topic of chapter 4, showing two salient factors predicting atypicality perceptions in fashion products made from repurposed materials: consumers were uncertain about the functional performance and sustainability benefits of such products.

Based on the findings of chapter 3, Chapter 4 examined the effects of attribute changes in fashion products made from repurposed materials on consumer response to such products. These attributes included function, sustainability, and visual distinguishability (whether repurposed materials look distinguishable from conventional materials). Changing materials in fashion products may lead consumers to develop different perceptions/evaluations of these attributes and eventually change product choices. A series of choice experiments revealed how consumers make trade-offs between these three attributes in fashion products made from repurposed materials.

In the concluding chapter, I argued which processes could matter by collating evidence from the three empirical chapters, which showed that (1) The evaluation of products made from repurposed materials is *not* understood as how schema congruity theory predicts; (2) Consumers consider fashion products made from repurposed materials atypical because they are uncertain about the functional

performance and sustainability benefits of such products; (3) Whether consumers trade function for sustainability or another way around depends on whether the sustainability attribute is explicitly presented; (4) consumers prefer repurposed materials to be not distinguishable from conventional materials. This thesis has proposed possible psychological processes of how consumers respond to fashion products made from repurposed materials and provided practical suggestions for marketers and product designers to promote such products.

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About the author

About the author

Xin Gao was born in China in 1990. In 2013, he obtained the Bachelor of Science degree in Applied Psychology from Beijing Normal University, Zhuhai Campus, China. In 2014, he came to the Netherlands to study Behaviour Science Research Master at Radboud University, Nijmegen. After obtaining his MSc degree in 2016, he started to work as a research assistant at the Behaviour Science Institute and the Faculty of Arts at Radboud University. From 2018 to 2022, he worked on this PhD project at Marketing and Consumer Behaviour group at Wageningen University, which resulted in the book you are reading now. Currently, he works at the Communication Science department at University of Amsterdam as a lecturer teaching research methods and statistics.

Completed training and supervision plan

Xin Gao
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan

Wageningen School of Social Sciences

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
A1 Managing a research project			
WASS Introduction Course	WASS	2018	1
Writing the research proposal	WUR	2018	6
"How Does Incongruity Perception Influence Product Evaluation? Examination of the Inverted U Shape Relation Predicted by Schema Congruity Theory"	ASPO EMAC ACR	2019 2020 2021	1
A2 Integrating research in the corresponding discipline			
Quantitative data analysis: Multivariate techniques, YRM 50806	WUR	2018	6
Modelling and Simulation of Complex Socio-Technical Systems, INF 51806	WUR	2021	6
Causal Inference in Empirical Economics	WASS	2022	4
B) General research related competences			
B1 Placing research in a broader scientific context			
Bayesian spring seminar	GESIS, Koln	2019	6
Tidy data transformation and visualization with R	PE&RC, WUR	2020	0.9
B2 Placing research in a societal context			
Writing a blog for MCB group		2023	0.1
C) Career related competences/personal development			
C1 Employing transferable skills in different domains/careers			
Teaching courses, YSS 20306	MCB	2018-2021	4
Total			**35**

*One credit according to ECTS is on average equivalent to 28 hours of study load

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