



Review

Consumer acceptance of products made from recycled materials: A scoping review

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ABSTRACT

Consumers have a positive attitude towards products made from recycled materials; however, they frequently end up not purchasing them. To shed light on the factors that influence consumer preferences and acceptance of products made from recycled materials, a scoping review was conducted with the following objectives: (1) to explore which factors are drivers of the acceptance of products made from recycled materials, (2) to identify and analyse potential barriers for their adoption, and (3) to formulate recommendations for future research in order to further enhance choices of alternatives made from recycled materials. The review of the results from 46 articles demonstrated that factors such as environmental benefits, perceived quality, safety, risks, emotions, and individual differences influence consumer acceptance of products made from recycled materials. The present review presents the state-of-the-art of the existing literature and future potential directions that can be fruitful for academics and practitioners interested in the topic.

1. Introduction

The circular economy supports the transformation of the linear consumption model into a closed-production model, so that production and consumption waste is reused and incorporated into the economy to create new value (Calvo-Porràl & Lévy-Mangin, 2020). The adoption of circular practices facilitates sustainable consumption by reducing the negative effects caused by excessive resource production and consumption.

Closing the circular loop by reusing materials and reducing consumption is therefore vitally important. Consumers play a crucial role in a circular economy because their choices can either support or hinder circularity (Calvo-Porràl & Lévy-Mangin, 2020; Wagner & Heinzl, 2020). Several loops are possible in a circular economy, such as reuse, repair, refurbishment, and recycling. Although recycling is not the most preferred loop in a circular economy (e.g. Sabbaghi & Behdad, 2018; Vanegas et al., 2018), it is an inevitable loop for many products and contexts (e.g. plastic film included in packaging, or a broken plastic box) and thus important to explore. In this paper, we focus on understanding consumer responses towards, and acceptance of products made from recycled materials. These products may be made from recycled plastics, textile fibres or metals and include, for instance, apparel, durables (such

as consumer electronics, furniture, and auto parts) and fast-moving consumer goods (FMCG, such as detergents, paper, trash bags, and kitchen bags).

Prior literature has focused solely on the impact of specific influencing factors, and therefore lacks a holistic approach to the acceptance of products made from recycled materials. Investigation of the influencing factors separately does not make it possible to capture all aspects influencing the adoption of products made from recycled materials. For instance, even though products made from recycled materials are considered eco-friendly and are positively evaluated by consumers (Mobley et al., 1995), consumers often do not prefer them (e.g. Park & Lin, 2020). What are the reasons driving this (non-)behaviour? Further research is required to provide a comprehensive overview of the factors that influence consumer acceptance of products made from recycled materials.

The need to develop research linking different areas of knowledge stimulates us to study the factors that influence consumers' intention to purchase a product made from recycled materials. However, to date, no other scoping review on the consumer acceptance of products made from recycled materials has been conducted. Two related systematic reviews were found: one on recycled textiles in specific (Wagner & Heinzl, 2020) and one on remanufactured products (Bigliardi et al.,

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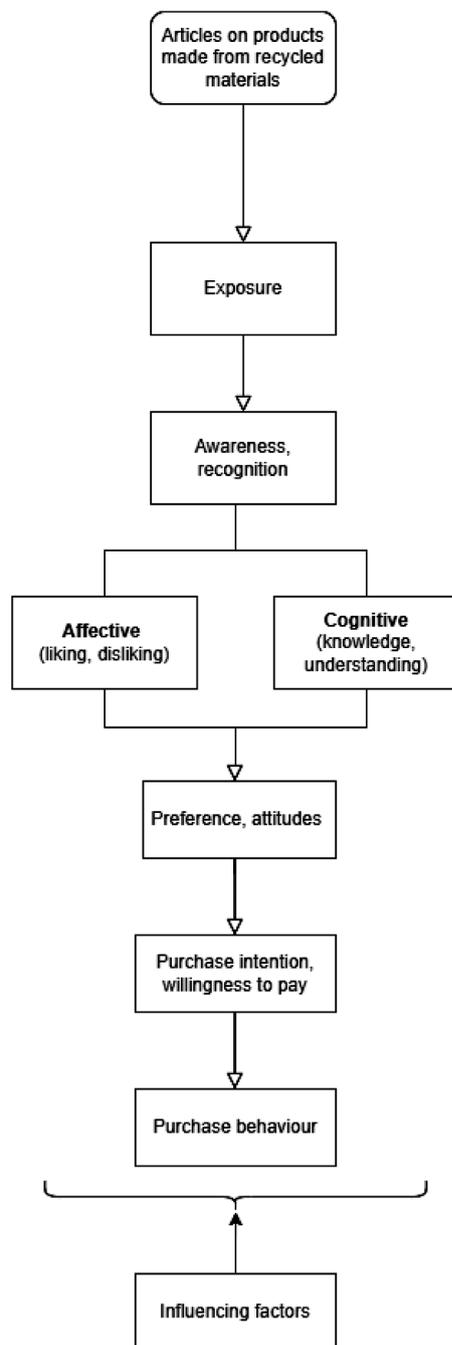


Fig. 1. Conceptual framework inspired by Lavidge and Steiner (1961).

2020). In the present review, we take a more general approach and focus on consumer acceptance of all consumer products made from recycled materials. In this context, the main purpose of this study is to provide a review on consumers' adoption of products made from recycled materials. Variables driving consumers' preferences for, and acceptance of these products are highlighted. Specifically, three objectives are pursued: (1) to explore which factors are drivers of acceptance of products made from recycled materials, (2) to identify potential barriers to the adoption of such products and (3) to formulate recommendations for future research.

This scoping review contributes to the existing literature by providing a comprehensive framework of the various factors that influence consumer responses towards products made from recycled materials as well as future directions on this research topic. We believe that this research is valuable for academics interested in the topic, as this

framework could assist them in theorising additional effects. We also provide useful insights into consumers' acceptance of products made from recycled materials for managers. These insights can help them develop strategies to increase acceptance and alleviate consumers' negative responses towards these products.

2. Conceptual framework

The conceptual framework applied in the present review was inspired by the Hierarchy of Effects Theory (Lavidge & Steiner, 1961). This framework was preferred over alternative conceptual frameworks (e.g. The Theory of Planned Behaviour; Ajzen, 1991 or the Theory of Reasoned Action; Fishbein & Ajzen, 1975) as these alternatives do not include the awareness stage and thus do not capture the entire spectrum of the purchase decision. Similarly, prior research (Grunert & Wills, 2007; Ketelsen et al., 2020) used the Hierarchy of Effects Theory to generate reviews focused on consumers' response to food labels and environmentally friendly food packaging.

The Hierarchy of Effects assumes that "consumers normally do not go from disinterested individuals to convinced purchasers in one instantaneous step" (Lavidge & Steiner, 1961, p. 59). Rather, they experience a sequence of several stages in order to reach their final purchase decision. First, they are exposed to the product made from recycled materials. Following the exposure process, they become aware of and recognise the product. Afterwards, a cognitive and an affective process take place in parallel. The cognitive process includes cognitive knowledge and understanding of the product features. The affective process includes the liking or disliking of the product, and the experience of any positive and/or negative emotions evoked. Based on these parallel processes, consumers' attitudes towards and preferences for products made from recycled materials are formed. This step leads to purchase intentions for products made from recycled materials. Finally, purchase intentions can lead to the actual purchasing behaviour of the product. In addition, influencing factors, such as individual differences, sociocultural factors and demographics, that influence the above steps are included in the conceptual framework (cf. Figure 1).

3. Method

3.1. The scoping review

The present review is based on the scoping review approach, an increasingly adopted methodology for summarising and reporting research evidence (Davis et al., 2009; Daudt et al., 2013). A scoping review is usually applied to summarise the streams of literature on a general research topic and highlight key trends and research gaps for future research (Daudt et al., 2013). Thus, the value of the present scoping review is to map the body of literature on a research topic (Arksey & O'Malley, 2005) – that is, consumer acceptance of products made from recycled materials – in order to identify potential trends and to propose research questions to be answered in future research.

Prior publications on pro-environmental behaviour and circularity demonstrate the fit of the scoping approach for the present review. For example, Yuriev et al. (2020) used a scoping review based on the methodological framework proposed by Arksey and O'Malley (2005) to map the literature on individual green behaviours studied from the perspective of the Theory of Planned Behaviour. Arksey and O'Malley (2005) suggested the use of the following five steps in their methodological framework for conducting scoping reviews: (1) identify the research question, (2) identify relevant studies, (3) study selection, (4) chart the data, and (5) collate, summarise and report the results. Similarly, in this paper we will use these methodological steps to create a scoping review of consumer acceptance of products made from recycled materials.

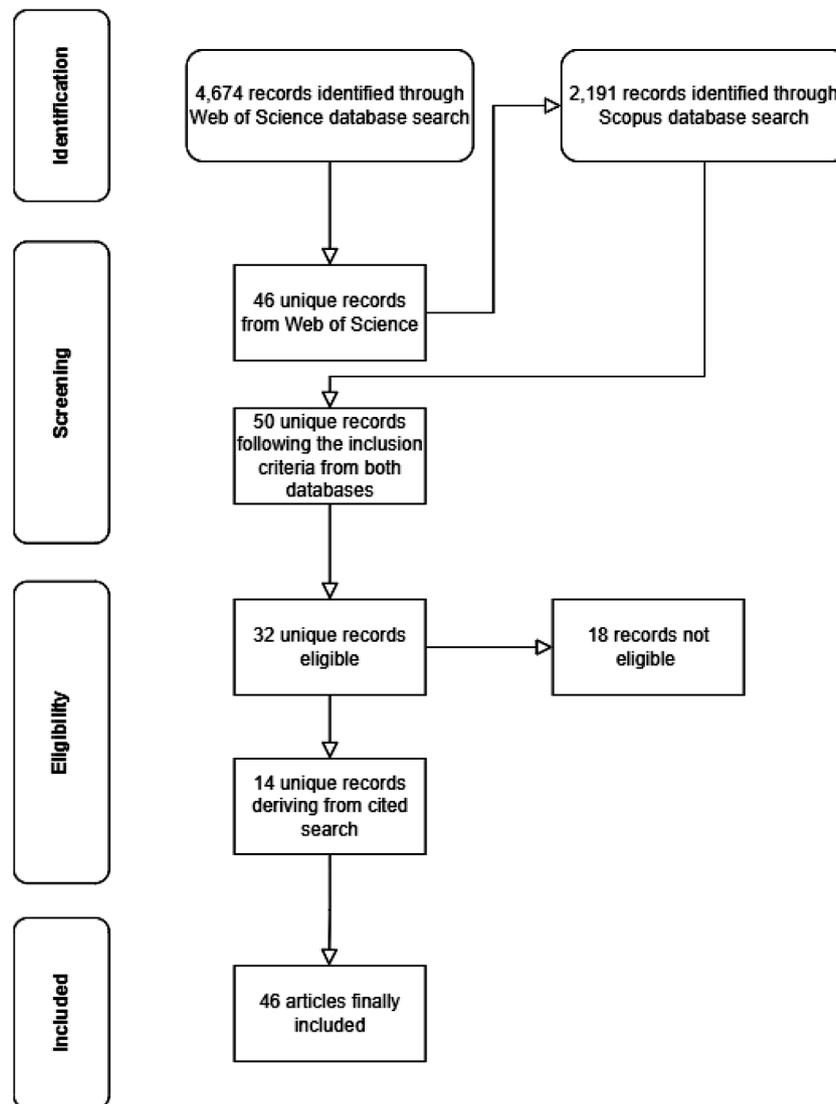


Fig. 2. Flowchart of the study selection process.

3.2. Identifying relevant studies

To this date and to the authors' knowledge, no other scoping review on the consumer acceptance of all consumer products made from recycled materials has been conducted. Two related systematic reviews were found: one on recycled textiles (Wagner & Heinzl, 2020) and one on remanufactured products (Bigliardi et al., 2020). The reference lists of five relevant, recent articles (Calvo-Poral and Lévy-Mangin, 2020; Hamzaoui-Essoussi and Linton, 2010; Nguyen et al., 2020; Magnier et al., 2019; Park and Lin, 2020) were manually searched to identify any other scoping reviews. No such reviews were found.

To select articles for this review, we conducted a search for relevant articles based on the academic databases Web of Science and Scopus. The following search terms were applied to screen title abstracts and keywords, with the use of the Boolean operators AND and OR: consumer AND recycled AND product; recycled AND (acceptance OR adoption OR preference). The search results yielded 4,674 records from Web of Science and 2,191 records from Scopus until March 29th, 2022.

3.3. Study selection

Regarding the process of study selection, we first used the academic database Web of Science as a search engine. This search resulted in

4,674 records. Then, based on the title, as well as on the abstract when the title was not clear, we applied specific inclusion and exclusion criteria in order to select only the articles that referred to consumer acceptance of products made from recycled materials (Colquhoun et al., 2014; Yuriev et al., 2020). Both theoretical and empirical articles were included for the scoping review. The review included journal papers, book chapters, editorials, and commentaries. Second, the research protocol was limited to articles published in English until March 2022. Third, we only included articles in which behaviours or responses were investigated at the individual (consumer) level. Fourth, the articles included were expected to be mainly focused on consumers' acceptance (adoption, preference) of products made from recycled materials.

As a consequence, we excluded operational research, engineering, chemistry, biological science, pharmacology, physics, astronomy, planetary science, and computer science journals that did not fit with the consumer perspective of the present review. Similarly, because we focus on the individual consumer and thus the micro level of circular economy (Kristensen & Mosgaard, 2020), we excluded papers that referred to circular economy policies and strategies at the macro (i.e. global, national) and meso (i.e. industrial symbiosis, eco-industrial parks) levels. We also excluded articles focusing only on remanufactured/refurbished products and kept articles referring to products made from recycled materials.

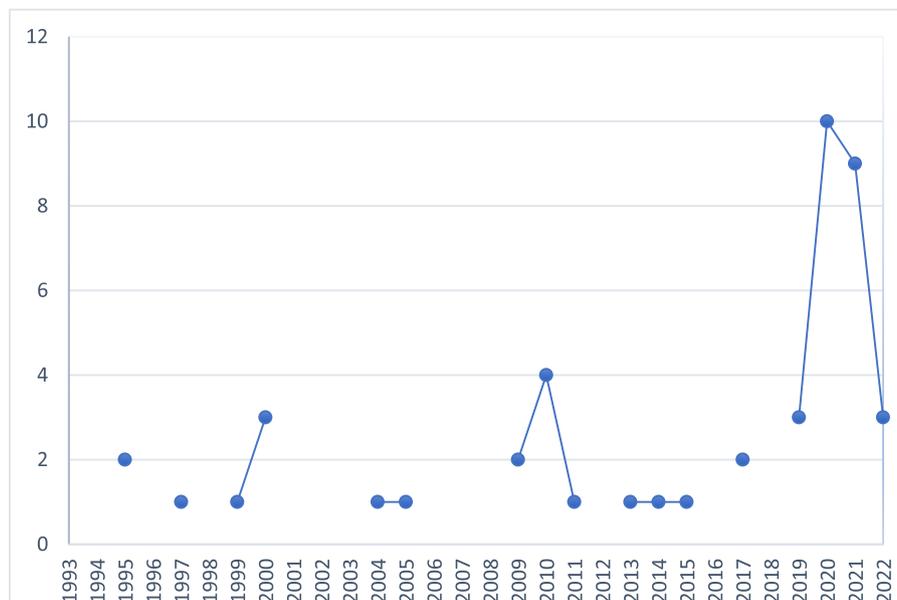


Fig. 3. Trend in the number of articles per year from 1995 until March 2022.

With respect to the inclusion criteria, we concluded in the selection of 46 unique records. Then, we used Scopus as a second search engine, with the same search words. This search resulted in 2,191 publications. From these, we explicitly searched for articles that were not yet included in the first search, using the same inclusion/exclusion criteria as discussed above. This resulted in the inclusion of four new unique records, leading to a total of 50 unique records from both databases.

Finally, during the eligibility step, articles focusing on consumers' acceptance of recycled water were not considered eligible for the scope of the present research and were left out. Consumer responses to recycled water are expected to differ greatly from those to consumer products made of recycled materials, as recycled water often serves specific purposes (mostly accepted for public or home garden irrigation; Fielding, Dolnicar and Schultz, 2018) and is not considered an alternative for all uses of traditional water. Instead, consumer products made from recycled materials are intended to serve as direct replacement of consumer products made from virgin materials. Furthermore, acceptance of recycled water is higher in regions experiencing water shortages (Adapa et al., 2016; Fielding, Dolnicar and Schultz, 2018; Garcia-Cuerva et al., 2016) because people indicate that they would accept the need to use recycled water during drought (e.g. Dolnicar & Hurlimann, 2009). Hence, demand for recycled water is greatly influenced by water scarcity. On the contrary, consumer products are currently not scarce. For the reasons analysed above, acceptance of products made from recycled materials is expected to differ strongly from that of recycled water and a review integrating both topics would only result in conflicting findings.

This last criterion reduced the number of unique eligible records to 32. A cited search was then conducted, including a snowball technique in which citations within the 32 articles as well as relevant papers that cited these 32 articles were searched and retained if they appeared relevant to the review (Hepplestone et al., 2011). This final step led to a pool of 46 selected articles (see Figure 2 below).

3.4. Charting the data, summarising, and reporting results

To chart the data, a data extraction grid was created, including two categories: general information about the publications (article title, journal name, year of publication) and information based on the method used (method of data collection, sample) (Table 1 of the Appendix A).

The process of summarising and reporting the review results was divided into two steps. First, we analysed literature trends based on a

number of articles published each year. Then, each paper was reported by categorising its findings in the appropriate step(s) of the conceptual framework presented in Fig. 1. Finally, we clustered all relevant findings for each step. This process of summarising and clustering the data has been of paramount importance for laying the foundation for the subsequent analysis based on key constructs that were identified to influence consumer acceptance of products made from recycled materials.

4. Literature trends and research methodologies

4.1. Literature trends

According to the extracted data, consumer responses to products made from recycled materials have been studied since 1995. Over the last ten years, scholars have shown more scientific interest in this field (see Fig. 3). The moving average for the five-year periods 1995-1999 and 2005-2009 was calculated as 0.8 and 0.6 articles per year, respectively, while that for the five-year period 2015-2019 was significantly higher, 1.2 articles per year. Interestingly, in the last two years (2020 - March 2022), 22 more articles were published, accounting for over 45% of the total reference pool size, providing support for the notion that the literature trend for products made from recycled materials has grown very rapidly over the last two years.

4.2. Research methodology of the articles reviewed

The vast majority of articles included in this review based their results on primary quantitative research (43 articles); one article was a systematic literature review on recycled textiles, and two articles were book chapters including secondary data. It is remarkable that there was little variation in terms of the methods of data collection applied in the quantitative articles: twenty-four articles were based on surveys, mostly in the form of offline, online, or mail questionnaires. Fewer (16) articles applied experiments. Most of these articles (14) applied traditional lab experiments with treatment randomization that have great internal validity to test the effects of specific interventions but lack external validity and only focus on attitudes and hypothetical willingness to purchase. Two articles made use of a discrete choice experiment, which enables a comparison of participants' valuation of the product made of recycled materials in relation to products made of virgin materials. Interestingly, field experiments that enable the testing of interventions

in a real-life setting, thereby having greater external validity, were not employed by any of the articles included in the review. Two field experiments included in the articles reviewed did not focus on products made from recycled materials, but on other circular products, such as upcycled products. Finally, two articles applied observational research and one article was based on interviews.

4.3. Stimulus materials of the articles reviewed

Regarding exposure, empirical articles ($n = 43$) exposed participants to stimuli of products made from recycled materials. We present a summary of the stimuli used in the papers by referring to both stimuli format and stimuli content. Regarding the stimuli format, only fifteen papers presented participants with images (real or imaginary products, labels, or types of packaging). Of these fifteen papers, eleven papers applied experiments (two of which applied discrete choice experiments). Most papers (28) exposed participants to textual stimuli together with written questions focused on products made from recycled materials. Regarding the thematic content of the stimuli, the majority (40) of papers exposed participants to “products made from recycled materials” (e.g. made from recycled plastics/rubber) or “recycled products” (e.g. recycled clothes), while three papers exposed participants to products made from recycled materials that were described as being made “from recycled content” or “with recycled ingredients”.

A variety of product categories were investigated in the articles included in this review. Fourteen articles focused on apparel, apparel accessories and fashion stimuli. Thirteen articles focused on FMCG, such as detergents, personal/hygiene products, paper, water bottles, cartons, trash bags, greeting cards and kitchen bags, while thirteen articles focused on durables, such as consumer electronics, furniture, tyres and auto parts, and one article focused on hotels that use products made from recycled materials.

4.4. Theoretical foundations and methods of articles reviewed

Regarding the use of relevant theories, thirty empirical articles analysed consumer preferences, willingness to pay (WTP) or purchase intentions with regard to products made from recycled materials by applying choice experiments and random utility theory (e.g. De Marchi et al., 2020), conjoint analysis (e.g. Achabou & Dekhili, 2013; Wang et al., 2022) and Thaler's (1983) acquisition-transaction utility theory (e.g. Bei & Simpson, 1995). Ten articles applied attitude-behaviour relationship theories (e.g. Theory of Planned Behaviour; Ajzen, 1991, Theory of Reasoned Action; Fishbein & Ajzen, 1975) or similar value-attitude-behaviour approaches (e.g. Kim et al., 2021). Three articles did not fall in one of the two theoretical fields analysed above and covered a diverse spectrum of constructs, including material sensorial attributes, cue utilisation, and emotions.

5. Synthesis of review results

We have structured our findings of the scoping review based on the conceptual framework, as summarised in Fig. 1. We begin with an analysis of the consumers' awareness and recognition stage and proceed to knowledge and understanding (cognitive) and liking or disliking (affective) of products made from recycled materials, preference for and attitude towards products made from recycled materials, intention to purchase products made from recycled materials, and finally, actual purchase. Factors influencing consumer responses, including individual differences, sociocultural factors and demographics, are also analysed.

5.1. Awareness and recognition

Twelve of the reviewed articles referred to consumers' awareness and recognition of products made from recycled materials. The most important findings are analysed below.

5.1.1. Awareness

The results of four of these articles provided support for the notion that consumers in developed countries (e.g. Canada, the Netherlands) are generally aware of products made from recycled materials (Hamzaoui-Essoussi & Linton, 2010, 2014; Magnier et al., 2019; Nakano, 2010). In Canada, participants indicated an above neutral familiarity with products made from recycled materials (Hamzaoui-Essoussi & Linton, 2014). In the UK, the population was aware of products made from recycled materials to an average extent; 32.7% of UK respondents would not be surprised at all to hear that fleece garments can be made from recycled plastic bottles (Nakano, 2010). However, like academics' interest in the topic, this percentage may have increased greatly over the last decade.

When it comes to articles based on samples from developing countries (e.g. East and Southeastern Asia, Turkey), the situation is mixed. Respondents from five Asian countries (China, Singapore, Vietnam, Thailand, Indonesia) indicated that they are generally unaware of and inexperienced with products made from recycled materials, and with circular economy practices in general (Kuah & Wang, 2020). However, different findings were derived from a fashion-specific survey in Vietnam, as 86% of the participants expressed “awareness of the ability to apply recycled plastic waste in the fashion sector” (Nguyen et al., 2020, p.7). In other developing countries, such as Turkey, awareness of this issue is growing among the young generation, especially due to environmental courses taught at school (Bulut & Nazli, 2020).

5.1.2. Recognition

The recognisability of products made from recycled materials is defined as the degree to which the fact that a product is made from recycled materials is reflected in the visual appearance of the product (Magnier et al., 2019). Recognisability can be achieved through a specific pattern or texture on the product, or through a verbal claim added on the product or its packaging.

Without any recognisable elements, it is hard to identify the fact that the product is made from recycled materials. For instance, Du Bois et al. (2021) found that consumers identify a sustainable material, such as one made from recycled plastic, as one that has a weaker colour intensity, a rather colourless, matte surface, rough texture and many speckles.

A Dutch sample of consumers reported that they find it important that products made from ocean plastic are recognisable (Magnier et al., 2019). Recognisability was especially important for textile products and FMCG in comparison to durables.

In addition, US consumers recognised the recycled nature of kitchen garbage bags (Anstine, 2000) or paper towels (Srinivasan & Blomquist, 2009) through ecolabels and recycling logos. Eco-labelling is a factor that facilitates recognisability among Asian consumers as well. In an Asian sample, 22% of the participants perceived ecolabels as an identifying feature determining subsequent consumer responses towards products made from recycled materials (Kuah & Wang, 2020).

5.2. Cognitive and affective responses

Eighteen articles referred to the knowledge and understanding of products made from recycled materials and eight articles referred to the affective responses towards these products.

5.2.1. Cognitive responses (knowledge and understanding)

In general, the popularity of products made from recycled materials has increased during the last decades because these products provide significant environmental benefits. We will further analyse this below.

5.2.1.1. Environmental friendliness. Products made from recycled materials can be perceived as “circular”, “environmentally friendly”, or otherwise “green” in the eyes of consumers, thereby triggering a favourable image (Calvo-Porrall & Lévy-Mangin, 2020; Queiroz et al.,

2021). Increasingly, consumers join the ranks of “recycled consumers” (Micklethwaite, 2004) and appreciate products made from recycled materials because of their concern about the environment and awareness of environmental issues (e.g. Sun et al., 2018). For instance, respondents in an Asian study reported that products made from recycled materials are associated with a minimal environmental impact (Kuah & Wang, 2020). Similarly, respondents from a Dutch panel perceived significant environmental benefits in a study focusing on apparel made from ocean plastic (Magnier et al., 2019). Finally, Kim et al. (2021) as well as Chi et al. (2021) highlighted the different types of perceived value associated with products made from recycled materials, such as the social value (defined as the perceived utility associated with a particular social group), epistemic value (defined as the perceived utility obtained from observers’ curiosity about the product’s novelty), and environmental value (defined as a belief about the earth or natural environment and humanity’s relationship with it). However, it is unlikely to assume that environmentally conscious consumers will purchase any type of product made from recycled materials due to its environmental benefits (Rucker, 2009); we must also understand the compromises consumers are willing to make before the purchase of such products after they also assess their perceived risks.

5.2.1.2. Perceived risks. Products made from recycled materials are perceived not only in terms of (environmental) benefits but also in terms of risks; consumers often perceive products made from recycled materials to be inferior to new conventional products (Bei & Simpson, 1995; Hamzaoui-Essoussi & Linton, 2014). To holistically present how consumers perceive the potential risks of products made from recycled materials, we draw on the theory of perceived risk (Mitchell, 1992 in Magnier et al., 2019). Specifically, articles on consumers’ evaluations of products made from recycled materials have shed light on the perceived risks that could hinder the adoption of these alternatives. Understanding the perceived risks related to products made from recycled materials is important, as they can hinder the adoption of these products (Sun et al., 2018). Perceived risks of products made from recycled materials involve performance (or functional) risk (e.g. Kuah & Wang, 2020), financial risk (e.g. Park & Lin, 2020), safety risk (Calvo-Porrall & Lévy-Mangin, 2020; Magnier et al., 2019; Queiroz et al., 2021) or even aesthetic risk (e.g. Kim et al., 2021).

Perceived quality is defined as the judgement and assessment of the excellence of the product made from recycled materials compared to non-recycled alternatives (Sun et al., 2018). The fact that a product is made from recycled materials can decrease consumers’ perceived quality of the product (Achabou & Dekhili, 2013; Bei & Simpson, 1995; Kuah & Wang, 2020; Magnier et al., 2019; Mobley et al., 1995; Sun et al., 2018), leading to higher performance risk, and therefore to higher financial risk as well, through decreased perceptions of the product’s value for money (e.g. Hamzaoui-Essoussi & Linton, 2010). For instance, in an Asian study, consumers reported that they were highly concerned about the perceived reliability and quality of electronics/e-gadgets made from recycled materials (Kuah & Wang, 2020). Similarly, another study in Hong Kong (Sun et al., 2018), focusing on diverse circular products, including products made from recycled materials, revealed that consumers often mentioned a need for information regarding the product, materials used, and quality assurance processes in relation to the utility of the products made from recycled materials (Sun et al., 2018). In a study focused on recycled apparel (Park & Lin, 2020), a Korean sample of respondents scored relatively positive in terms of perceived quality. Relatively high levels of perceived risk, related to the functionality of products made from recycled materials, were also demonstrated in two Canadian articles (Hamzaoui-Essoussi & Linton, 2010, 2014) through a variety of products (electronics, paper, tyres, and auto parts). Akkucuk (2011) corroborated the findings of Hamzaoui-Essoussi & Linton (2010) and highlighted potential functional (for durables) risk as a main factor that consumers took into

consideration while evaluating products made from recycled materials. As an exception to the findings above, Dutch respondents of a study focusing on ocean plastic reported to have high expectations for quality and functionality (Magnier et al., 2019). These quality expectations were found to be lower for textile products than for durables and FMCG. The sample of Dutch individuals who participated in the study consisted of respondents who were generally wealthy and highly educated, and therefore more prone to respond positively to environmental initiatives. Nonetheless, people may have evolved in terms of their perceptions over the past years and generally notice fewer differences in quality between virgin and recycled materials, regardless of their socioeconomic background.

Risk regarding perceived safety (Akkucuk, 2011; Calvo-Porrall & Lévy-Mangin, 2020; Magnier et al., 2019; Queiroz et al., 2021) is another factor to consider regarding acceptance of products made from recycled materials. One factor related to (lack of) perceived product safety could be uncertainty – such as due to lack of previous experience or knowledge about product safety – which may act as a factor hindering the purchase decision (Calvo-Porrall & Lévy-Mangin, 2020). Akkucuk (2011) revealed potential health risks (for sanitary products) that consumers considered while evaluating products made from recycled materials. Similarly, Kim et al. (2021) identified the sanitary risk of clothing made from recycled materials as a reflection of consumers’ perception of the possibility that such products might not be hygienic and thus potentially harm one’s health. However, it should be highlighted that a Dutch sample of consumers perceived textile products, durables and FMCGs made from ocean plastic as safe options (Magnier et al., 2019).

Finally, aesthetic risk is the risk deriving from a potential lack of attractiveness (Testa et al., 2021), or from the perception that the purchased product will not be in line with the consumer’s self-image (Kim et al., 2021). Specifically, Kim et al. (2021) demonstrated that the aesthetic risk of apparel made from recycled materials may refer to concerns about whether these apparel products are well coordinated with the other apparel that the consumer owns, and hence whether they satisfy consumers’ need for a congruent self-image, or whether their size is a poor fit. Therefore, aesthetic risk could be a factor that leads consumers to delay or abandon the purchase of products (e.g. apparel) made from recycled materials (Kim et al., 2021; Testa et al., 2021).

5.2.2. Affective responses (liking and disliking)

Apart from the cognitive evaluations of products made from recycled materials, affective responses (liking or disliking) towards these products were identified from prior literature. Only eight of the reviewed articles provided evidence on consumers’ affective liking (or disliking) towards products made from recycled plastic and are analysed below.

5.2.2.1. Positive feelings. Affective responses include consumers’ positive feelings elicited by their efforts to reduce the damage done to the environment (Mobley et al., 1995). Consumers anticipate that liking and preferring products made from recycled materials will make them feel positive emotions, such as pride (Adigüzel & Donato, 2021) because they are contributing to a better world. Magnier et al. (2019) referred to anticipated conscience, defined as a consumer’s expectations regarding how the product will make him/her feel in an ethical sense. Finally, Tezer & Bodur (2020) referred to the positive feelings associated with green products, such as products made from recycled materials, as “warm glow” feelings; the authors highlighted an increase in the extent to which consumers are valued as individuals by society, which leads to these warm glow feelings, and consequently enhances the enjoyment of the associated consumption experience.

5.2.2.2. Self-expression. Apart from their environmental benefits, consumers also perceive products made from recycled materials as a way to improve their image or satisfy their need for self-expression.

Environmental consumption of products made from recycled materials can serve as a positive social marker. Kamleitner et al. (2019) showed that consumers often perceive repurposed products, including products made from recycled materials, as a chance to express themselves and feel special. This holds especially for products that are designed to reveal their past product identity (e.g. plastic coming from the ocean) through various ways of storytelling. This effect exists because past identity salience induces narrative thoughts about these products' biographies, which in turn allows customers to feel special.

5.2.2.3. Contamination and negative feelings. Negative emotions towards products made from recycled materials relate to perceived contamination risk and the emotion of disgust. Perceived contamination can occur when people feel uncomfortable or even disgusted when using specific products that contain recycled materials. Even though consumers perceive that such products contribute to solving an environmental issue, these products may appear to be contaminated. Indeed, highlighting the recycled nature of products made from recycled materials – such as apparel from previously recycled plastic bottles – can serve as an activation cue for contamination beliefs among consumers (Meng and Leary, 2021). Considering that the garment is made mostly from recycled plastic bottles that have come into touch with other people, consumers may view the product as contaminated (Baxter et al., 2017 in Meng and Leary, 2021). As a result, even though the product goes through considerable state changes to achieve its current condition, consumers feel that its materials remain contaminated, as this resistance to purification is permanent (Meng and Leary, 2021).

Meng and Leary (2021) explained these perceptions from an evolutionary perspective, as protection against disease and pathogenic agents is an ancient psychological mechanism (also see Fundamental Motives Framework; Kenrick et al., 2010). In general, human beings have evolved to believe that the characteristics of certain items may hurt them and for this reason they have made behavioural adjustments to avoid these items and therefore preserve their “behavioural” immune system (Meng and Leary, 2021). From this perspective, disgust has evolved as a response of extreme displeasure, that ultimately results in aversion to the source of the emotion, which in this case is a product made from recycled materials due to their prior usage by others. Contamination risk was also unveiled as a key factor by Magnier et al. (2019). Interestingly, consumers from the Dutch panel reported that they are relatively unconcerned about the perceived contamination risk.

5.2.2.4. Psychological risk. Psychological risk is the experience of distress arising from anticipated post-behavioural reactions, emerging from failure to meet expectations (Hamzaoui-Essoussi & Linton, 2010; Sun et al., 2018). Consumers may experience psychological risk during their evaluations of products made from recycled materials through affective reactions, such as worry and regret caused by purchasing and using the product (Hamzaoui-Essoussi & Linton, 2010). However, Hamzaoui-Essoussi & Linton (2010) highlighted that the majority of moderately environmentally conscious consumers are characterised by lower psychological risk because the purchase of such products can reflect their environmental concerns and values.

5.3. Attitudes and preferences

Twelve of the articles included in the review referred to consumers' attitudes towards and preference for products made from recycled materials. Consumers' attitudes towards products made from recycled materials are generally positive (e.g. Anstine, 2000; Calvo-Porrall & Lévy-Mangin, 2020) and often significantly higher than their non-sustainable counterparts, even for luxury products (Adigüzel & Donato, 2021). For instance, respondents' attitudes towards products made from recycled materials were positive in a US sample for hygiene products (Mobley et al., 1995). Similarly, a Dutch (Magnier et al., 2019)

and a Spanish sample (Calvo-Porrall & Lévy-Mangin, 2020) reported to have favourable attitudes towards and a positive image of products made from recycled materials, while Micklethwaite (2004) highlighted that UK consumers prefer products made from recycled materials to their non-recycled counterparts of a similar price and quality level.

Various factors have been identified as predictors of attitudes towards and preferences for these products. Based on a Korean sample, Kim et al. (2021) examined perceived values and risks as potential antecedents of attitude towards products made from recycled materials. Their findings suggested that perceived value dimensions in fashion made from recycled materials can create a positive product attitude even if consumers perceive risks. In particular, the influence of emotional, social and environmental values on attitude was significant, while financial and functional risks did not significantly affect consumers' product attitude. Among the risk factors, aesthetic and sanitary risk had the greatest negative impact on consumers' product attitude.

Other studies in Japan, Italy, Spain, Turkey and the US revealed that perceptions of sustainability (Kumagai, 2020), presence of the recycled material (Testa et al., 2022), norms, environmental predispositions and beliefs about the environmental impact (Bulut & Nazli, 2020) are predictors for the preference for products made from recycled materials in general (Bulut & Nazli, 2020), the preference for women's apparel products (Kumagai, 2020), attitudes towards backpacks made from recycled materials (Testa et al., 2022), or even for attitudes towards a green hotel that uses recycled solutions (Kim & Han, 2010). Hence, the benefits highlighted in the previous sections that referred to the cognitive and affective evaluations seem to outweigh the risks in the formation of a favourable attitude towards products made from recycled materials.

Finally, Luchs et al. (2010) provided some boundary conditions for the degree to which the sustainable nature of products made from recycled plastic enhances preference and demonstrated that consumers usually associate higher product ethicality with gentleness-related attributes (e.g. health, safety) as well as lower product ethicality with strength-related attributes (e.g. quality). The positive effect of the sustainability of products made from recycled materials on consumer preference is reduced when strength-related attributes are valued more (sustainability liability hypothesis), for instance in the case of tyres made from recycled rubber. However, Luchs et al. (2010) highlighted that the potential negative impact of sustainability on preference is attenuated when explicit cues, such as tags guaranteeing product strength and quality, are provided.

5.4. Purchase intentions and willingness to pay

Twenty-six of the articles provided substantial evidence of factors influencing consumers' purchase intentions or willingness to pay for products made from recycled materials. The most important findings are analysed below.

5.4.1. Purchase intentions of products made from recycled materials

Perceived safety (Calvo-Porrall, & Lévy-Mangin, 2020; Luu & Baker, 2021; Queiroz et al., 2021), favourable image (Calvo-Porrall, & Lévy-Mangin, 2020; Queiroz et al., 2021), attractiveness (Testa et al., 2021), eco-friendliness of the packaging (Testa et al., 2021), availability of eco-labels (Wang et al., 2022) as well as attitudes (Kim et al., 2021; Testa et al., 2022) were found to be significant antecedents of purchase intentions; when these factors are perceived to be more positive, purchase intentions are also increased.

Furthermore, when quality was perceived to be lower, this led to decreased purchase intentions (Kuah & Wang, 2020; Luu & Baker, 2021; Nguyen et al., 2020; Queiroz et al., 2021; Sun et al., 2018; Testa et al., 2021). Similar effects were found for functional risk (Magnier et al., 2019) and contamination risk (Magnier et al., 2019; Meng and Leary, 2021) as these were recognised as factors that negatively influence purchase intentions.

Finally, some articles approached purchase intentions from an attitude perspective. For instance, [Kumagai \(2020\)](#), based on a Japanese survey on recycled luxury apparel, showed that the perceived sustainability of recycled plastic clothing leads to increased attitudes (i.e. cognitive and affective evaluations that lead to overall favourable or unfavourable appraisals) towards the brand, indirectly augmenting purchase intentions, even though the direct effect of sustainable apparel on purchase intention was found to be contradictorily negative. These contradictory effects are significant for more luxurious brands, providing support for the notion that the incorporation of recycled materials in luxury fashion products does not necessarily generate sales growth, even though it leads to increased attitudes towards the brand.

5.4.2. Willingness to pay for products made from recycled materials

Several articles suggested that the presence of recycled materials in products leads to mixed effects regarding willingness to pay, with variations among product categories ([Akkucuk, 2011](#); [Hamzaoui-Essoussi & Linton, 2014](#)). A comparison of willingness to pay between products made from recycled materials and virgin products among Canadian and Dutch consumers revealed that consumers seem to be willing to pay more for products made from recycled materials in a variety of categories (papers, electronics, tyres, FMCG, athleisure (intended for both exercising and general use) apparel, water bottles packaged in recycled materials, durables) ([Chi et al., 2021](#); [Galati et al., 2022](#); [Hamzaoui-Essoussi & Linton, 2010](#); [Magnier et al., 2019](#)). However, contradictory findings were found for apparel made from recycled fibres by [Pretner et al. \(2021\)](#), recycled bottles of water ([De Marchi et al., 2020](#)) and garbage bags made from recycled plastic ([Anstine, 2000](#)), for which the willingness to pay was lower. Interestingly, [Pretner et al. \(2021\)](#) demonstrated that when consumers are provided with information about the environmental virtues of the product, and especially when that information is verified by a third party, consumers' willingness to pay increases significantly.

Recognisability of products made from recycled materials is an antecedent of willingness to pay; the presence of ecolabels (also see the section on "Recognition") was found to be a significant predictor of willingness to pay for e-gadgets in Asia and kitchen rolls on a US website ([Kuah & Wang, 2020](#); [Srinivasan & Blomquist, 2009](#)). Importantly, willingness to pay is higher for products made from recycled materials whose sustainable characteristics can be easily recognised by consumers ([De Marchi et al., 2020](#); [Magnier et al., 2019](#)).

Furthermore, emotions such as anticipated conscience ([Magnier et al., 2019](#)), as well as highlighting the past identity of the recycled alternative through storytelling techniques on the packaging ([Kamleitner et al., 2019](#)) were found to positively influence willingness to pay a premium for products made from recycled materials.

As expected, perceived quality and safety are significant antecedents of willingness to pay for various product categories ([Chi et al., 2021](#); [Hamzaoui-Essoussi & Linton, 2014](#); [Magnier et al., 2019](#)). Similar effects were found for functional risk and willingness to pay ([Akkucuk, 2011](#); [Hamzaoui-Essoussi & Linton, 2010, 2014](#)).

5.5. Actual purchase of products made from recycled materials

Only eight articles focused on actual purchase of recycled alternatives. [Sun et al. \(2018\)](#) found that purchase intentions are a significant predictor of actual purchase for products made from recycled materials using a Hong Kong student sample. On the other hand, [Kuah & Wang \(2020\)](#) revealed a non-significant relationship between purchase intentions and actual purchase of e-gadgets in the context of an Asian sample. Two articles ([Micklethwaite, 2004](#); [Tezer & Bodur, 2020](#)) highlighted a gap between intentions and actual behaviour, while other articles ([Grasso et al., 2000](#); [Park & Lin, 2020](#)) referred to an attitude-behaviour gap. Interestingly, [Park & Lin \(2020\)](#) unveiled the factors of quality and subjective norms (which refer to the normative expectations of others and capture the social pressure people feel about

adopting or not adopting a certain behaviour, such as purchasing products made from recycled materials) as significant antecedents of actual purchase. Finally, [Sun et al. \(2018\)](#) followed a Theory of Reasoned Action perspective ([Fishbein & Ajzen, 1975](#)) and showed that attitudes towards environmental protection are indirect predictors of actual purchase of products made from recycled materials in Hong Kong through their effect on purchase intentions. Similarly, [Biswas et al. \(2000\)](#) also applied the TRA and revealed that subjective norms, affect and past behaviour significantly predict actual purchase of products made from recycled materials in the context of US consumers.

5.6. Influencing factors

Nineteen articles emphasised the significance of individual differences and sociocultural factors as having an influence on consumer responses to products made from recycled materials. First, environmental concern, conceptualised as the extent to which consumers are worried about threats to the environment ([Calvo-Porrall & Lévy-Mangin, 2020](#); [Minton & Rose, 1997](#)), as well as perceived consumer effectiveness, defined as the extent to which individuals believe that their actions make a difference in solving a problem ([Kim & Choi, 2005](#)), have been found to influence the purchase of products made from recycled materials ([Bulut & Nazli, 2020](#); [Calvo-Porrall & Lévy-Mangin, 2020](#); [Chaturvedi et al., 2020](#); [Kim & Choi, 2005](#); [Kuah & Wang, 2020](#); [Mahmoodi & Heydari, 2021](#); [Magnier & Schoormans, 2015](#); [Park & Lin, 2020](#)). For instance, consumers who are more environmentally concerned and with greater perceived consumer effectiveness reported increased intentions to purchase recycled fashion products ([Park & Lin, 2020](#)) and recycled e-gadgets in Asia ([Kuah & Wang, 2020](#)). Consumers who are more environmentally concerned were also found to be more willing to purchase bottles made from recycled materials, even when inconsistencies between their visual and verbal sustainability claims existed ([Magnier & Schoormans, 2015](#)). Finally, [Kim & Han \(2010\)](#) proposed a modification of the Theory of Planned Behaviour (TPB; [Ajzen, 1991](#)) by including environmental concern and perceived consumer effectiveness. The modified model led to a significantly better prediction of consumers' intention to select a green hotel that uses products made from recycled materials than the original TPB model.

An additional individual difference refers to sensitivity to disgusting stimuli, referred to as disgust sensitivity ([Meng and Leary, 2021](#)). Disgust sensitivity was found to amplify the effect of perceived contamination risk of apparel made from recycled plastic bottles on the likelihood to purchase, such that consumers who are more sensitive to disgust were likely to express lower purchase intentions. In addition, this effect was stronger for recycled plastic products that touch the skin, such as apparel.

The implicit theory type is an additional individual difference identified by [Biraglia et al. \(2017\)](#). Incremental theorists (i.e. individuals who believe traits are malleable and can change) showed higher intention to purchase a product made of recycled plastic, compared to entity theorists (who instead believe traits are fixed and unchangeable). Incremental theorists see effort as an important part of human nature because it allows people to grow and progress. Consequently, perceived effort in creating products made from recycled materials was found to mediate the relationship between product type and purchase intention, and this effect was found to be stronger for incremental theorists ([Biraglia et al., 2017](#)).

Four sources identified the influence of community and individualism as sociocultural factors that influence purchase intentions for products made from recycled materials. [Chi et al. \(2021\)](#) found that relatives and friends can positively affect U.S. millennial consumers' intentions to purchase recycled athleisure apparel. [Nguyen et al. \(2020\)](#) unveiled that community influence played a significant role in the intention to purchase fashion products made from recycled materials in Vietnam, meaning that the more the media or local influencers talked about the product, the more likely it was that these products would

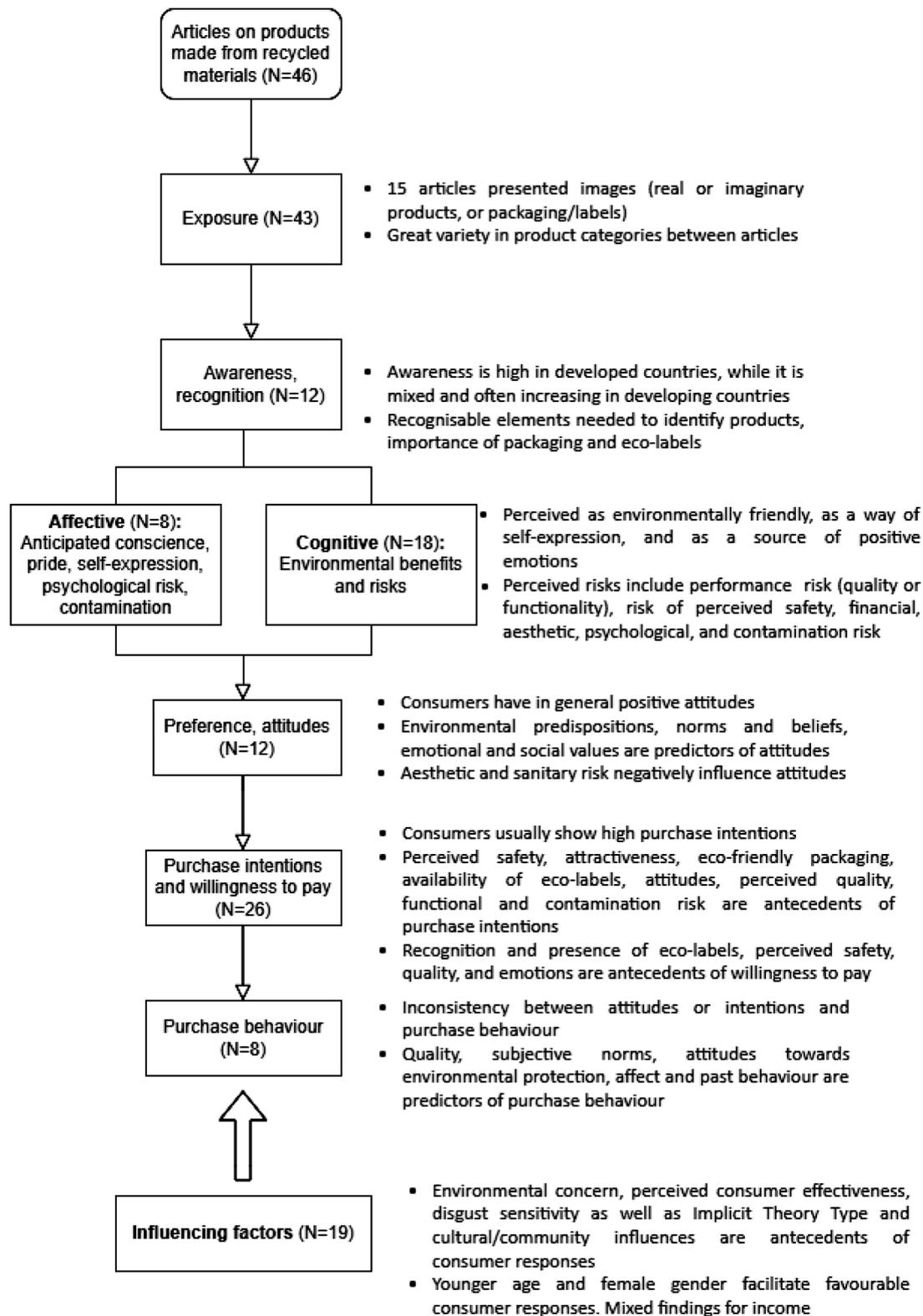


Fig. 4. Synthesis of the key findings of the present review.

attract more people to buy them. Kishino et al. (1999) investigated the acceptance of recycled toilet paper by both German and Japanese consumers and concluded that Japanese recycled toilet paper users appear not to support recycled toilet paper actively in contrast to Germans. This difference may be explained by cultural differences between German and Japanese people. Germans make decisions more self-assertively than the Japanese and therefore favour the novel recycled solution to

a greater extent. Kim et al. (2021) referred to a cultural difference, individualism, and revealed that individualism moderated the effect of values and risks on purchase intention for fashion products made from recycled materials among Koreans. This is explained by the fact that people with strong individualism are inclined to value their own interests, purposes, experiences, and values rather than social situations. Consequently, individualists are less interested in products made from

recycled materials because they are less sensitive to the social environment.

Demographic factors, such as age, income, and gender, also influence consumer responses to products made from recycled materials. To begin with, younger adults are likely to have a higher appreciation for products made from recycled materials and higher levels of environmental consciousness, compared to the whole population (Hamzaoui-Essoussi & Linton, 2014). Other sources (Park & Lin, 2020, Srinivasan & Blomquist, 2009) unveiled a significant negative influence of age on purchase intention for specific products made from recycled materials. Interestingly, a US study on paper towels (Srinivasan & Blomquist, 2009) showed that, as the age of consumers increases, their probability of purchasing eco-labelled paper towels and their willingness to pay a premium decrease.

Park & Lin (2020) highlighted that a higher income leads to higher probability of buying fashion items made from recycled materials in Korea. In contrast, findings (Srinivasan & Blomquist, 2009) on income in the US indicated that as the income of US consumers increases, the probability of purchasing recycled paper towels decreases. This appears to contradict the findings of Grasso et al. (2000) and the idea that consumers living in countries with higher income and wealth demand higher environmental quality products (Srinivasan & Blomquist, 2009). Finally, some articles (Achabou & Dekhili, 2013; Grasso et al., 2000) revealed a significant effect of gender on preferences for recycled apparel; women were more likely to purchase such products compared to men.

6. Discussion, future research, and conclusion

6.1. Discussion

Through a scoping literature search we identified 46 articles published between 1995 and March 2022 focusing on consumer acceptance of products made from recycled materials. Fig. 4 summarises the findings of the present review, structured according to the conceptual framework of the review.

The fact that more than 50% of the articles were published in the last five years provides support for the notion that research on consumer acceptance of products made from recycled materials is a young research field attracting growing interest from academia. The findings of this scoping review allow us to achieve the two initial objectives of the study: to provide an analytical overview of the factors driving consumer acceptance of products made from recycled materials; and to consolidate fragmented knowledge on the perceived barriers that hinder their adoption. The present review contributes to existing research by mapping the existing body of literature related to the various stages leading to the acceptance of products made from recycled materials: from exposure and recognition to cognitive and affective responses, attitudes and preferences, purchase intentions, and finally, actual purchasing behaviour. The findings provide fruitful insights for practitioners, such as managers and designers, who are interested in identifying and tackling the perceived risks hindering the adoption of such products, or in exploring potential antecedents of consumer attitudes, intentions, and purchase behaviour.

Nonetheless, in accordance with the third objective of the study, as defined in the Introduction, we also need to shape future research agendas. The next section discusses gaps in the investigated topics concerning consumer acceptance of products made of recycled materials and the limitations of the used research methods as potential avenues for future research.

6.2. Recommendations for future research

We present various recommendations for future research regarding the acceptance of products made from recycled materials. The recommendations are structured following the stages of the conceptual

framework (see Fig. 4). We also take the methodological limitations of the articles included in the present review under consideration.

6.2.1. Recognition

Regarding the recognition stage, our review has shown conflicting effects regarding the effect of recognisability on consumer acceptance of products made of recycled materials. Whether consumers will evaluate recognisability of recycled materials as inferior or superior will strongly depend on the way this recognisability is implemented and the specific conditions that are used to market the product. Guidelines on how recognisability can be designed (e.g. through physical appearance, or promotion) were not identified in the review. Accordingly, the underlying mechanisms of how recognisability may influence intentions and actual purchasing behaviour and the conditions in which recognisability is either contributing or detrimental for consumer acceptance remain unexplored. Nonetheless, more and more companies nowadays have commercialised products made from recycled materials that are recognisable through their pattern, texture, or promotion. We propose that future academic research should focus on providing companies with guidelines on how and when to communicate that a product is made from recycled materials.

6.2.2. Cognitive responses and alleviation of perceived risks

The present review unveiled that, even though products made from recycled materials have significant perceived environmental benefits, consumers also assess their perceived risks. Future research could explore how to reduce the perceived performance risk of products made from recycled materials. One potential direction for future research could be to investigate how providing longer warranties, certificates of quality, or how applying different business models might alleviate this risk. Offering a subscription or a rental service (Tunn et al., 2019), instead of a one-time purchase of the product is a promising business model that could eliminate performance quality risks and guarantee high quality or a long product lifespan to consumers.

In addition, while prior research has shown that highlighting the recycled nature of a product made from recycled plastics leads to higher perceived contamination, and therefore to lower purchase intentions, future researchers still need to unveil how to attenuate this perceived contamination risk. The only guideline unveiled by prior literature is to exploit evolutionary responses to attractive others, for example, through attractive stimuli as part of the packaging in order to achieve positive contamination (Meng and Leary, 2021). Obviously, this proposal cannot be followed by all firms producing products made from recycled plastics and therefore other potential contamination-reducing strategies need to be explored. An extrapolation of recent findings on consumer acceptance of refurbished products (Wallner et al., 2022) provides fruitful ground for future research on such strategies in the context of products made from recycled materials. For instance, designing a certificate that the product made from recycled materials is clean or using virgin materials for product parts for which higher levels of contamination are expected (e.g., parts touching the skin; Wallner et al., 2022) may be promising strategies that deserve more research attention. Furthermore, companies can develop communication and promotion messages to lower contamination associations. The design and content of such communication messages need to be further investigated.

Recycled plastics are not always available in all patterns, textures and colours, and may therefore be perceived as uglier (aesthetic risk; Kim et al., 2021) than conventional virgin plastics. Findings on the acceptance of ugly food, such as fruit and vegetables suggested that consumer choices of suboptimal products depend on the type of suboptimality (e.g. de Hooge et al., 2017). Furthermore, consumers showed different preferences for such aesthetically suboptimal products, due to their commitment to sustainability. Hence, extrapolating this conceptualisation leads to the following research question: how can the acceptance of products made from recycled materials that are perceived as less attractive be fostered? Future research could try to answer this

Table 1
Information about the publications included and the method used.

Authors	Article title	Year	Method of data collection	Sample
Achabou, M. A., & Dekhili, S.	Luxury and sustainable development: Is there a match?	2013	One lab experiment with treatment randomization	131 French consumers
Adıgüzel, F., & Donato, C.	Proud to be sustainable: Upcycled versus recycled luxury products	2021	Three lab experiments with treatment randomization	VAR Mturk participants
Akkucuk, U.	Combining Purchase Probabilities and Willingness to Pay Measures: A Case on Recycled Products	2011	Questionnaire	63 Turkish students
Anstine, J.	Consumers' willingness to pay for recycled content in plastic kitchen garbage bags: a hedonic price approach	2000	Observation	194 observations in 35 US stores
Bei, L. T., & Simpson, E. M.	The determinants of consumers' purchase decisions for recycled products: an application of acquisition-transaction utility theory	1995	Mailed questionnaire	137 US residents and University students
Biraglia, A., Brakus, J. J., Brizi, A., & Mannetti, L.	Sneakers Made of Used Plastic-How Consumers' Implicit Theories Affect Buying Recycled Products	2017	Two lab experiments with treatment randomization	Unknown
Biswas, A., Licata, J. W., McKee, D., Pullig, C., & Daughtridge, C.	The Recycling Cycle: An Empirical Examination of Consumer Waste Recycling and Recycling Shopping Behaviors	2000	Questionnaire	286 US consumers
Bulut, C., & Nazli, M.	Environmental Predispositions and Recycled Product Preferences	2020	Street survey	256 Turkish students
Calvo-Porrall, C., & Lévy-Mangin, J. P.	The Circular Economy Business Model: Examining Consumers' Acceptance of Recycled Goods	2020	Internet self-administered questionnaire	312 Spanish consumers
Chaturvedi, P., Kulshreshtha, K., & Tripathi, V.	Investigating the determinants of behavioral intentions of generation Z for recycled clothing: an evidence from a developing economy.	2020	Questionnaire	497 Indian students
Chi, T., Ganak, J., Summers, L., Adesanya, O., McCoy, L., Liu, H., & Tai, Y.	Understanding perceived value and purchase intention toward eco-friendly athleisure apparel: Insights from US millennials.	2021	Interviews	16 U.S. millennials
De Marchi, E., Pigliafreddo, S., Banterle, A., Parolini, M., & Cavaliere, A.	Plastic packaging goes sustainable: An analysis of consumer preferences for plastic water bottles	2020	Discrete choice experiment	119 Italian
Du Bois, E., Veelaert, L., Tormans, E., & Moons, I.	How should plastic recycles look like to be perceived as sustainable: a first exploration	2021	Three surveys	VAR (designers and non-designers)
Galati, A., Alaimo, L. S., Ciaccio, T., Vrontis, D., & Fiore, M.	Plastic or not plastic? That's the problem: Analysing the Italian students purchasing behavior of mineral water bottles made with eco-friendly packaging.	2022	Online survey	409 Italian students
Grasso, M. M., McEnally, M., Widdows, R., & Herr, D. G.	Consumer Behavior toward Recycled Textile Products	2000	Discrete choice experiment	345 US students
Hamzaoui-Essoussi, L., & Linton, J. D.	New or recycled products: how much are consumers willing to pay?	2010	Survey/questionnaire	49 graduate students
Hamzaoui-Essoussi, L., & Linton, J. D.	Offering branded remanufactured/recycled products: at what price?	2014	Survey/questionnaire	550 students of Canadian University
Kamleitner, B., Thürridl, C., & Martin, B. A.	A Cinderella Story: How Past Identity Salience Boosts Demand for Repurposed Products	2019	Two (out of a total of four) lab experiments with treatment randomization on recycled products	VAR (Austrian and M-Turk participants)
Kim, I., Jung, H. J., & Lee, Y.	Consumers' Value and Risk Perceptions of Circular Fashion: Comparison between Secondhand, Upcycled, and Recycled Clothing	2021	Survey/questionnaire	850 Korean consumers
Kim, Y., & Choi, S. M.	Antecedents of Green Purchase Behavior: an Examination of Collectivism, Environmental Concern, and PCE	2005	Survey	304 US students
Kim, Y., & Han, H.	Intention to pay conventional-hotel prices at a green hotel - a modification of the theory of planned behavior	2010	Online questionnaire	3000 US hotel customers
Kishino, H., Hanyu, K., Yamashita, M., & Hayashi, C.	Recycling and consumption in Germany and Japan - a case of toilet paper	1999	Lab experiment with treatment randomization	998 German and 1242 Japanese consumers
Kuah, A. T., & Wang, P.	Circular economy and consumer acceptance: An exploratory study in East and Southeast Asia	2020	Questionnaire at social media	584 Asian consumers from five countries
Kumagai, K.	Sustainable plastic clothing and brand luxury: a discussion of contradictory consumer behaviour	2020	Online questionnaire	315 female Japanese consumers
Luchs, M. G., Naylor, R. W., Irwin, J. R., & Raghunathan, R.	The sustainability liability: Potential negative effects of ethicality on product preference	2010	Two (out of three) lab experiments with treatment randomization on recycled products	VAR (students)
Luu, T. T. A., & Baker, J. R.	Exploring Consumers' Purchase Intention of rPET Bottle-Based Apparel in an Emerging Economy	2021	Survey/questionnaire	495 Vietnamese consumers
Magnier, L., & Schoormans, J.	Consumer reactions to sustainable packaging: The interplay of visual appearance, verbal claim and environmental concern	2015	Two lab experiments with treatment randomization	185 French and 119 Dutch consumers
Magnier, L., Mugge, R., & Schoormans, J.	Turning ocean garbage into products e Consumers' evaluations of products made of recycled ocean plastic	2019	Online questionnaire	258 Dutch consumers
Mahmoodi, H., & Heydari, J.	Consumers' preferences in purchasing recycled/refurbished products: an empirical investigation	2021	Survey/questionnaire	150 Iran respondents
Meng, M. D., & Leary, R. B.	It might be ethical, but I won't buy it: Perceived contamination of, and disgust towards, clothing made from recycled plastic bottles	2021	Three lab experiments with treatment randomization	VAR MTurk participants
Micklethwaite, P.	The recycled consumer - evidence and design implications	2004	N/A	N/A
Minton, A. P., & Rose, R. L.	The Effects of Environmental Concern on Environmentally Friendly Consumer Behavior: An Exploratory Study	1997	Mail survey	144 US consumers
Mobley, A. S., Painter, T. S., Untch, E. M., & Rao Unnava, H.	Consumer Evaluation of Recycled Products	1995	One lab experiment with treatment randomization	89 US University students
Nakano, Y.		2010	Street survey	95 UK consumers

(continued on next page)

question by investigating additional mechanisms for how to counter-balance (lack of) attractiveness while ensuring consumer acceptance of products made from recycled materials.

6.2.3. Affective responses

Another avenue for future research would be to explore how to optimise the affective responses of products made from recycled materials. One idea could be based on “warm glow” feelings (Tezer & Bodur, 2020) that are currently included as part of the post-consumption experience. Past research on emotions and decision making (Emotion-imbued choice model; Lerner et al., 2015) provided support for the notion that anticipated emotions can also shape the evaluation of a decision task (e.g. whether or not to buy a product made from recycled materials) and, most importantly, the decision output. Therefore, future research could examine how the promise of warm glow feelings and positive anticipated consumption experience can encourage consumers to adopt products made from recycled materials.

6.2.4. Purchase intentions

Several articles included in the present review highlighted that purchase intentions towards products made from recycled materials are usually high and unveiled several antecedents. However, most articles did not investigate the effect of brands on purchase intentions. Further research may examine the influence of brands and test whether the use of recycled materials could increase or decrease consumers' evaluations and purchase intentions of certain types of brands in diverse product categories. For instance, if a brand is not distinguished for its sustainability focus, it would be interesting to examine whether the use of recycled materials would be perceived as a way of ethical corporate responsibility, or as a method of greenwashing (Delmas and Burbano, 2011) that can negatively influence purchase intentions. Future research could also investigate to what extent brand concepts (i.e. unique meanings and associations with the brand; Torelli, Monga and Kaikati, 2012) can increase purchase intentions of products made from recycled materials.

6.2.5. On the intention-behaviour gap

The inconsistency between intentions and actual purchase behaviour (Tezer & Bodur, 2020) remains unexplained. Park & Lin (2020) highlighted that the consumer percentage exhibiting positive high purchase intention was 35% higher compared to that of the consumers engaging in purchasing products made from recycled materials. To better understand how to minimise this intention-behaviour gap, research in marketing and social psychology previously focused on the drivers of green product purchase (Kim & Choi, 2005; Srinivasan & Blomquist, 2009). However, these drivers have not been investigated in depth in the specific context of products made from recycled materials. Future research should investigate the underlying mechanisms of this intention-behaviour gap. First, future research may focus on examining how situational factors, such as availability of products made from recycled materials or macro-economic trends (e.g. inflation due to scarcity of materials, or deflation leading to an increase in purchasing power) may influence the aforementioned gap and influence actual purchasing behaviour.

Second, to gain a better understanding of actual purchase behaviour of products made of recycled materials, future research could explore other research methods that focus on real-life purchase behaviours. In the current articles, various surveys and experimental methods were employed that bring about several limitations. A limitation of surveys is that these articles involve self-reports and, as such, participants may have been subject to a social desirability bias. Many of the experimental articles (14) applied traditional lab experiments with treatment randomization that have great internal validity to test the effects of specific interventions but lack external validity and only focus on attitudes and hypothetical willingness to purchase. Two articles made use of a discrete choice experiment, which enables a comparison of participants' valuation of the product made of recycled materials in relation to products made of virgin materials. Field experiments that enable the testing of interventions in a real-life setting, thereby having greater external validity, were not employed by any of the studies on products made of recycled materials that were included in our review. Prior literature has identified that there is a difference between what people

Table 1 (continued)

Authors	Article title	Year	Method of data collection	Sample
	An evaluation of the potential for wider use of recycled synthetic materials in the UK high street clothing markets: its drivers and barriers			
Nguyen, X., Tran, H., Nguyen, Q., Luu, T., Dinh, H., & Vu, H.	Factors influencing the consumer's intention to buy fashion products made by recycled plastic waste	2020	Email questionnaire	425 Vietnam consumers
Park, H. J., & Lin, L. M.	Exploring attitude-behavior gap in sustainable consumption: comparison of recycled and upcycled fashion products	2020	Questionnaire	217 Korean participants
Pretner, G., Darnall, N., Testa, F., & Iraldo, F.	Are consumers willing to pay for circular products? The role of recycled and second-hand attributes, messaging, and third-party certification.	2021	Two lab experiments with treatment randomization	2400 MTurk participants
Queiroz, F. C. B. P., Lima, N. C., da Silva, C. L., Queiroz, J. V., & de Souza, G. H. S.	Purchase Intentions for Brazilian Recycled PET Products—Circular Economy Opportunities	2021	Online survey	422 Brazilian consumers
Rucker, M.	Consumer perceptions of recycled textile fibers	2009	N/A	N/A
Srinivasan, A. K., & Blomquist, G. C.	Ecolabeled paper towels: Consumer valuation and expenditure analysis	2009	Observation from online shop	34100 observations
Sun, H., Teh, P. L., & Linton, J. D.	Impact of environmental knowledge and product quality on student attitude toward products with recycled/remanufactured content: Implications for environmental education and green manufacturing	2018	Questionnaire from internet forum and education course	215 Hong Kong University students
Testa, F., Di Iorio, V., Cerri, J., & Pretner, G.	Five shades of plastic in food: Which potentially circular packaging solutions are Italian consumers more sensitive to.	2021	One lab experiment with treatment randomization	1236 Italian consumers
Testa, F., Gusmerotti, N., Corsini, F., & Bartoletti, E.	The role of consumer trade-offs in limiting the transition towards circular economy: The case of brand and plastic concern.	2022	One lab experiment with treatment randomization	1000 Italian and Spanish consumers
Tezer, A., & Bodur, H. O.	The Greenconsumption Effect: How using green products improves consumption experience	2020	Three (out of a total five) lab experiments with treatment randomization on recycled products	VAR
Wagner, M. M., & Heinzel, T.	Human Perceptions of Recycled Textiles and Circular Fashion: A Systematic Literature Review	2020	Systematic review	N/A
Wang, L., Xu, Y., Lee, H., & Li, A.	Preferred product attributes for sustainable outdoor apparel: A conjoint analysis approach.	2022	One lab experiment with treatment randomization	404 young U.S. consumers

expect to do in experimental and survey studies (e.g., hypothetical willingness to purchase) and their purchase behaviour in real-life (e.g., real willingness to purchase). This difference, coined as the hypothetical bias (e.g. Schmidt & Bijmolt, 2020) is a measure of each method's external validity (Harrison & Rutström, 2008). Only eight papers included in the present review focused on actual purchase and only two of the reviewed articles analysed consumers' purchase behaviour in a real marketplace (e.g. through test markets or consumer purchase panels). Therefore, it is important for future research to focus more on measuring actual purchasing behaviour in a real world setting by using methods with greater external validity in order to eliminate the hypothetical bias and to potentially bridge the intention-behaviour gap. Avenues for future research can also draw examples on measuring real purchasing behaviour from literature on consumer acceptance of recycled water, in which field experiments were employed that studied participants who made actual purchasing decisions concerning recycled water (Savchenko et al., 2018; Whiting et al., 2019).

In this respect, it may also be interesting to investigate the intention-behaviour gap through longitudinal studies that are currently missing in the field of acceptance of products made from recycled materials, and in general of green behaviours (Yuriev et al., 2020). Such longitudinal studies may contribute through potentially unveiling changes in consumer responses and behaviours after repeated purchase of FMCG, or after purchase and successful use of durable products made from recycled materials.

Through this future research, we hope that scientific knowledge on consumer acceptance of products made from recycled materials will continue to grow in order to help companies interested in using recycled materials for their products. Only if products made from recycled materials obtain a more prominent position in the market and are adopted as viable alternatives by consumers, they can contribute to a circular economy and help to lower the impact of our consumption on the environment.

Declaration of Competing Interest

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

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Appendix A

Table 1

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