

Design Preferences based on the Up-Cycling Stage of a Fashion Product

Focusing on Gen Z Consumers and Re;Code Products

Yu Na Seo · Hyeonkyeong Shin · Ji An Lee · Chorong Youn* · Yoon Kyung Lee**†

Researcher, Dept. of Clothing & Textiles, Pusan National University, Pusan, Korea

Researcher, Dept. of Clothing & Textiles, Pusan National University, Pusan, Korea

Researcher, Dept. of Clothing & Textiles, Pusan National University, Pusan, Korea

**Assistant Professor, Dept. of Clothing & Textiles, Pusan National University, Pusan, Korea*

***†Assistant Professor, Dept. of Clothing & Textiles, Pusan National University, Pusan, Korea*

Abstract As sustainability has emerged as a key issue in the fashion industry, upcycling is expected to play a pivotal role in future sustainable design. Accordingly, this study analyzed the design of fashion products that can enhance their value by reproducing them using stock products or stock fabrics through upcycling. For this purpose, the design of upcycled products by Re;code, a representative upcycling brand in Korea, was analyzed based on Lee and DeLong's Re-birth stage. Additionally, to understand the design preferences of Generation Z consumers, Re;code products were classified into four concepts: minimal, sporty, feminine, and unique. The results showed that minimalist fashion designs with upcycling value can be perceived as new by Gen Z consumers. The findings of the conceptual and step-by-step analysis revealed that Gen Z's actual purchase of upcycled fashion products is more influenced by the product's concept than the upcycling stage.

Keywords Sustainability, Up-cycling, Re-birth, Gen Z, Fashion product

Citation Seo, Y. N., Shin, H., Lee, J. A., Youn, C., & Lee, Y. K. (2024). Design preferences based on the up-cycling stage of a fashion product: Focusing on Gen Z consumers and Re;code products. *International Journal of Costume and Fashion*, 24(2), 64-76.

Introduction

According to the European Commission (2023), the EU has highlighted the issue of clothing waste in Europe, stating that approximately 5.8 million tons of clothing, or 11 kilograms per person, are discarded annually, with fast fashion brands being a central part of the problem. In July 2023, the EU announced a proposal to apply extended producer responsibility (EPR) to all apparel products, a system that holds producers accountable from the production stage to the final waste collection. This initiative aims to limit apparel waste and build a sustainable and circular textile ecosystem (European Commission, 2023). The situation is similarly dire

in the domestic fashion industry. In Korea, 50 to 60 tons of clothing waste are generated daily, amounting to 100,000 tons annually as of 2022, with figures still rising (Kim, 2023). Korea also ranks fifth globally in exporting used clothing, following the United States, China, the United Kingdom, and Germany (Kim, 2023). Environmental concerns about clothing waste have thus emerged as a major issue in the fashion industry, prompting ongoing discussions about sustainable disposal methods for inventory. Currently, the predominant methods for disposing of obsolete products

Received October 29, 2024; Revised December 01, 2024;
Accepted December 12, 2024

† Corresponding Author: pollinallee@pusan.ac.kr

(unsold apparel for more than three to five years) are landfill or incineration (Lee & DeLong, 2016). However, these methods have severe environmental impacts. For example, polyester clothing takes at least 500 years to decompose in landfills, and incineration releases significant amounts of volatile organic compounds, which are carcinogenic (Hu, 2018). Recognizing the severity of this environmental problem, fashion brands are seeking various alternatives.

One such alternative is upcycling, which adds aesthetic value to waste materials and reclaims them for different uses. In Korea, the fashion brand Re;code actively addresses environmental issues caused by inventory by utilizing unsellable stock and upcycling it into new designs. Thus, upcycled fashion products present a significant alternative for the virtuous cycle of inventory. This study aims to identify the design characteristics of upcycled products to expand their market. Previous studies have shown that dissatisfaction with design aspects is a major barrier to purchasing upcycled fashion products (Yu & Cha, 2023). Generation Z (Gen Z), a cohort deeply concerned with environmental issues and sustainability, presents a compelling target audience for such initiatives. Despite their high awareness of sustainable consumption, studies reveal that while Gen Z consumers demonstrate strong interest and purchase intentions toward upcycled fashion products, their actual purchasing experience remains notably low (Jung & Lee, 2020; Kara & Min, 2024).

Recent studies on upcycled fashion have explored consumer attitudes, purchase intentions, design characteristics, materials, techniques, and design development. However, there remains a gap in research analyzing consumer responses to upcycled products currently available. This study focuses on the stages of upcycling, explicitly examining how consumer reactions vary depending on the extent to which the upcycled product differs from its original form. To achieve this, Re;code products were selected as the research subject, as they allow for access to information about both the original and upcycled versions of each product. As Re;code is recognized as the most established upcycled fashion brand in Korea, the findings are expected to hold significant implications.

Therefore, this study aims to address the gap in understanding consumer responses to upcycled products in

real-world scenarios. The research questions are as follows:

1. This study aims to examine and analyze the responses of Gen Z consumers to the products sold by Re;code, the most established upcycled fashion brand in Korea.
2. This study aims to understand the upcycling design characteristics preferred by Gen Z consumers and propose effective sustainable product development measures that can increase the purchase of upcycled fashion products.

Literature Review

The Global Fashion Industry and Sustainable Products

According to a BBC news report in 2022, the fashion industry emits 1.2 billion tons of greenhouse gases annually, accounting for 10% of global emissions (Stallard, 2022). The industry generates significant harmful substances, uses vast amounts of water in dyeing and processing, and produces 20% of the world's wastewater. These issues highlight the fashion industry's waste and environmental pollution challenges. Consequently, the fashion industry has recognized its responsibility and is pursuing various approaches to upcycling and eco-friendly materials, aligning with the eco-friendly movement of consumers. This requires not only product development with eco-friendly materials but also efforts to improve and implement each stage of production, distribution, sales, and recovery in an environmentally and socially ethical way (DeLong et al., 2016).









European Union (EU) countries are under pressure to produce products using eco-friendly materials. Global fashion brands like ZARA, H&M, and Nike are shifting towards sustainable production. For example, brands are replacing animal skins like leather and fur with bio-materials like mushrooms and pineapples and using waste plastic to make clothes and bags. Hermes has launched a bag made from mushroom leather (Kim, 2023). Fast fashion brands, often criticized for their role in apparel waste, are also making changes. ZARA introduced down jackets made from recycled

materials in collaboration with British brand Studio Nicholson and certified wool products by the Responsible Wool Standard (RWS). They also introduced Cycora, a recycled polyester material, and announced plans to reduce carbon emissions and become an eco-friendly company (Kang, 2023).

Initially, these moves were seen as greenwashing, but as times changed, fashion companies recognized the environmental impact of their products. They moved beyond superficial marketing strategies to develop genuinely eco-friendly products and continue expanding efforts to

develop fashion items that protect the environment. As fashion companies produce more eco-friendly products and implement transparent business ethics, consumer perceptions are also changing. According to a study by Lee (2023), most consumers are willing to purchase eco-friendly apparel if all conditions—design, quality, price, and brand recognition—are the same as regular products. This awareness is evident in global luxury brands like Prada and Armani Exchange, which are developing sustainable fashion products using recycled nylon and organic fabrics.

Table 1. Re-birth in 5 levels

Levels	Stock	Re-birth design	Description
Level 1			(Re-touch) details: Changes in supplementary materials, such as adding/removing decorations
Level 2			Pattern or materials: Changes in patterns or materials within the product
Level 3			Partial design: Partial changes in design
Level 4			Other design: Complete deconstruction and redesign
Level 5			Fashion accessories: Complete deconstruction for use in new non-garment products

Images sourced from Lee and DeLong (2016)

Gen Z and Sustainable Fashion

Under the global paradigm shift emphasizing environmental and social values, each generation's role as primary consumers is crucial. Forbes reported in 2019 that 62% of Generation Z prefer sustainable products and consider sustainability a key factor when purchasing clothes, including luxury goods (Cho, 2020). Gen Z consumers reflect their values in their purchases, considering company ethics and environmental friendliness. Their value-driven consumption, such as choosing products from ethical companies and eco-friendly products, significantly influences their purchase decisions.

Gen Z closely observes eco-friendly factors in product manufacturing and distribution, valuing coexistence and making it their consumption trend (Park, 2023). One characteristic of Gen Z is the green consumer, who considers eco-friendly raw materials, production methods, and packaging in their purchasing decisions. Companies are incorporating this trend into their marketing strategies and pursuing sustainable development through ESG (Environment, Social, and Governance) management. As consumers' interest in fashion companies expands to include the entire production, distribution, sales, and recycling process, planning and designing fashion products based on eco-friendly products and corporate ethical management have become more critical.

Re-Birth Design and Upcycling Design Levels

Increasing public awareness of ethical consumption, recycling, and the importance of the environment is the driving force behind the growth of the upcycling industry. Another great feature of upcycled products is their unique design. In the process of transforming upcycled products into new products that are completely different from the original, upcycling design aims to satisfy consumers' aesthetic sensibilities and maximize functionality and efficiency. In order for upcycled products to be sold with value as fashion products, they must have design value and self-expression value that can express the consumer's identity (Kim & Kim, 2018).

Upcycled fashion products go through a different process than conventional fashion design development. The process of upcycling product development can be understood through the study of Re-Birth Design (Lee & DeLong, 2016)

(see Table 1). Re-Birth Design consists of five levels. Level 1 is about changing materials, adding and removing embellishments, or changing the season of a product; Level 2 is about modifying the pattern or material properties of a part of an existing product; Level 3 is about combining parts of an existing product with other materials to create a new design; and Level 4 is about completely disassembling a product and transforming each part into a new design. Level 4 is when a product is completely disassembled and transformed into a new product with different materials and designs, and Level 5 is when a product is completely disassembled to be used as a material for fashion items other than clothing.





To establish the upcycling design levels, the concept can be reorganized based on Lee and DeLong (2016) re-birth levels. In this study, the apparel upcycling design stages are divided into four transformation stages from upcycling level 1 to upcycling level 4, as shown in Table 2. Upcycling level 1 is the levels of changing materials, adding and removing decorations, and changing the season of the product. Upcycling level 2 is the modification of partial patterns or material properties of existing products. The upcycling level 3 is to combine parts of the existing product with other materials and transform them into a new design, and the upcycling level 4 is to completely disassemble the existing product and transform it into a new product with different materials and designs. Since the re-birth design levels in previous studies include the upcycling steps of apparel and accessories, while this study focuses on the recycling and upcycling steps of apparel only, we redefined the concept according to the upcycling steps according to the level of apparel upcycling design and organized it into four steps as shown in Table 2.

Methodology

Research Design and Procedure

The purpose of this study is to categorize upcycled fashion products according to the upcycling design levels and examine how Gen Z consumers' responses to each level vary from both environmental and corporate performance perspectives. Upcycled fashion products are developed at

Table 2. Up-cycling design levels

Up-cycling level	Description	Image
Up-cycling level 1	Changing materials or adding/removing embellishments and seasonal changes	
Up-cycling level 2	Modifying partial patterns or material properties	
Up-cycling level 3	Transforming parts into a new design by combining with other materials	
Up-cycling level 4	Complete disassembly and transformation into a new product	

Images sourced from <http://re-code.co.kr>(Yoo, 2024)

various levels, ranging from very simple modifications to completely new products through product deconstruction and recombination (Lee & DeLong, 2016). Therefore, we analyzed the re-birth level of the product to see if the consumer response varies depending on the concept at each stage, and which stage of the product receives the most positive response from consumers according to the product concept.

This study was conducted in the following steps: analyzing Re;code products, selecting stimuli, developing a questionnaire, and collecting and analyzing data. First, we

collected photos and product information of the released products available on the official website of Re;code during July 2023. We excluded products made from recycled and stock fabrics as they do not meet the definition of upcycled fashion products in this study. To identify the upcycling stage, the original product of the labeled product must be identifiable, so the researchers cross-checked all the products on the official Kolon mall to ensure both the original branded product and the labeled product could be found. A total of 459 Re;code products with original brand products were extracted and organized according to Lee and DeLong's

(2016) upcycling stages. For each product, five researchers determined the applicable steps and checked for consensus to select the final product for each step. In case of disagreement among the researchers, the products were excluded from the final selection.

To select the final stimuli for each upcycling level from the products categorized by each level, we categorized representative types of design concepts based on previous research and literature. Kim (2010) categorized the images in women’s clothing as casual, modern, romantic, natural, elegance, chic, classic, dandy, and ethnic. Park (2008) also analyzed representative fashion images in Korean womenswear as classic, elegance, minimalist, romantic,

bohemian & vintage, ethnic, glam, girlish, kiddie, sporty, feminine, military, and lingerie, noting that classic, bohemian, and romantic images were consistently frequent in the early 2000s. Finally, Liu and Na (2023) presented the concepts of Gen Z’s preferred clothing styles of feminine, elegant, sporty, formal, and casual. Based on the above design concept classification, the top design concepts were grouped into four types: 1) minimal, 2) sporty, 3) feminine, and 4) unique, and the stimuli for each stage of upcycling were selected and analyzed.

As with the phase selection process, each researcher determined the concept for the entire product, checked for agreement, and finally extracted the product that all

Table 3. Up-cycling design stimuli

















Level	Minimal	Sporty	Feminine	Unique
Level 1				
	Changing materials and adding embellishments	Removing embellishments and changing seasonal length	Changing seasonal length	Changing seasonal length
Level 2				
	Modifying partial patterns	Modifying partial patterns	Modifying material properties	Modifying partial patterns
Level 3				
	Transforming parts into a new design by combining with other materials	Transforming parts into a new design by combining with other materials	Transforming parts into a new design by combining with other materials	Transforming parts into a new design by combining with other materials
Level 4				
	Complete disassembly and transformation into a new product	Complete disassembly and transformation into a new product	Complete disassembly and transformation into a new product	Complete disassembly and transformation into a new product

Image sourced from <https://www.re-code.co.kr/>(Yoo, 2024)

researchers agreed on. For each step, the researchers discussed the product that most clearly demonstrated the design concept to provide a representative example of the design concept as a stimulus. The questionnaire asked respondents whether they recognized the Re;code brand (Y/N), followed by a description of the Re;code brand image and identity. We decided that a basic awareness of upcycling was necessary to evaluate the products.

To evaluate the upcycled fashion products (stimuli), the survey was designed so that respondents could see one product photo, rate the product, and then see the next photo. Each respondent could answer all 16 stimuli in total, and the order of the 16 stimuli was randomized regardless of stage and concept to eliminate the order effect. Due to the nature of online surveys, there are limitations in identifying product features, so we used front and back photos and additional descriptions to convey product features. The evaluation of the product was measured on a 5-point Likert scale (1: not at all, 5: very much) using three questions: ‘sustainable’, ‘I like it’, and ‘I would buy it’. Finally, demographic characteristics and fashion product purchase characteristics were examined. The 16 selected products are shown in Table 3.

Data Collection and Participants

The data for this study was collected from August 23 to August 27, 2023, through an online survey. A total of 259 respondents were invited to participate voluntarily by posting a survey link on an internet community popular among female Gen Z consumers. Ultimately, only data from Gen Z

respondents in their 20s were included, resulting in 199 responses for analysis.

Examining the demographics of the respondents, the survey was completed by women aged 20 to 29. The average monthly clothing expenditure was as follows: 59.8% of respondents spent between 100,000 and 300,000 won, 26.6% spent less than 100,000 won, 11.1% spent between 300,000 and 500,000 won, and 2.5% spent more than 500,000 won. When looking at the types of fashion brands that respondents shop at (allowing for multiple responses), 69.8% selected SPA brands, 64.8% selected generic brands, 56.8% selected designer brands, 14.6% selected young casual brands, 6.0% selected contemporary brands, and 0.5% selected luxury brands. Regarding education, 57.3% of respondents have a high school diploma, 35.7% have a college education, and 14% have a graduate degree or higher.

Results

Evaluate Sustainability, Favorability and Purchase Intention

Each respondent evaluated stimuli from all four stages, and we initially planned to compare responses across experimental conditions using repeated measures ANOVA. However, Mauchly's Test of Sphericity revealed a heteroskedasticity issue. Consequently, we conducted six paired t-tests to compare responses between the stages.

Sustainability Gen Z female respondents in the survey

Table 4. Perceived sustainability by up-cycling level and design concept

Concept	Mean					t-value					
	Total	Level 1	Level 2	Level 3	Level 4	L1-L2	L1-L3	L1-L4	L2-L3	L2-L4	L3-L4
Minimal	3.96	3.67 Ca	4.00 B	3.95 B	4.11 A	-6.31***	-5.38***	-9.18***	0.87	-2.58**	-3.51***
Sporty	3.84	3.80 AB	3.83 A	3.91 A	3.69 B	-0.50	-1.86	1.79	-1.82	2.81**	5.41***
Feminine	3.77	3.89 A	3.67 B	3.73 B	3.74 B	4.65***	3.24***	3.02**	-1.32	-1.61	0.33
Unique	3.88	4.06 A	3.88 B	3.64 C	3.82 B	3.31***	8.05***	4.88***	4.85***	1.22	-3.62***

a: Groups with significant differences ($p < .05$) in paired *t*-tests are indicated by different letters. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5. Favorability by up-cycling level and design concept

Concept	Mean					t-value					
	Total	Level 1	Level 2	Level 3	Level 4	L1-L2	L1-L3	L1-L4	L2-L3	L2-L4	L3-L4
Minimal	3.62	3.00 Da	3.37 C	3.95 B	4.07 A	-5.33***	-14.37***	-15.56***	-9.30***	-11.38***	-2.23*
Sporty	3.38	3.63 A	3.49 B	3.51 AB	2.81 C	1.98*	1.53	11.15***	-0.39	9.94***	11.70***
Feminine	3.33	3.56 A	3.08 C	3.40 B	3.21 C	7.07***	2.32*	5.59***	-4.88***	-1.86	2.96**
Unique	3.45	3.51 B	3.82 A	3.20 C	3.15 C	-4.44***	4.64***	5.473***	9.91***	10.31***	0.74

a: Groups with significant differences ($p < .05$) in paired *t*-tests are indicated by different letters. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 6. Purchase intention by up-cycling level and design concept

Concept	Mean					t-value					
	Total	Level 1	Level 2	Level 3	Level 4	L1-L2	L1-L3	L1-L4	L2-L3	L2-L4	L3-L4
Minimal	3.31	2.51 Ca	3.02 B	3.81 A	3.92 A	-7.35***	-20.18***	-20.19***	-11.25***	-12.43***	-1.74
Sporty	3.05	3.18 AB	3.31 A	3.16 B	2.50 C	-1.69	0.19	8.63***	2.07*	10.98***	9.07***
Feminine	2.98	3.26 A	2.69 C	3.12 A	2.85 B	7.85***	1.90	5.86***	-6.43***	-2.30*	3.71***
Unique	3.08	3.03 B	3.60 A	2.86 C	2.77 C	-6.88***	2.17*	3.70***	10.77***	12.21***	1.45

a: Groups with significant differences ($p < .05$) in paired *t*-tests are indicated by different letters. * $p < .05$, *** $p < .001$

rated the sustainability of upcycled products utilizing stock products as high overall (see Table 4). When comparing the sustainability scores of the upcycling stages according to the design concept, the minimalist design had the highest score ($M=3.96$). There was no consistent relationship between the level of upcycling intensity and sustainability perceptions, with very different patterns for each concept.

The minimalist concept was found to have higher sustainability ratings as the upcycling level increased, with Level 1 having the lowest score ($M=3.67$) and Level 4 having the highest score ($M=4.11$), which was statistically significant. For the sporty concept, there was no statistical difference between upcycling levels up to Level 3, but at Level 4, where the most transformation and repurposing occur, the sporty concept scored statistically lower than the other levels ($M=3.69$). For the feminine concept, Level 1, the

lowest level of upcycling, had the highest sustainability rating ($M=3.89$), while Levels 2, 3, and 4 were not statistically different. Unique concepts also had a higher sustainability rating at Level 1 ($M=4.06$).

Likability Among all the concepts, the minimalist design had the highest likability evaluation score ($M=3.62$) among Gen Z female consumers. When comparing the likability ratings of the upcycling stages according to the design concept with a paired sample *t*-test (see Table 5), the minimalist concept showed the highest likability rating for the Level 4 design ($M=4.07$), which was the highest among all concepts and stimuli by stage. It is also interesting to note that, similar to the sustainability evaluation results, the minimalist concept designs showed higher favorability scores as the upcycling level increased.

On the other hand, the products in the other concepts

Table 7. Consumer responses by to up-cycling level

	Mean				t value					
	Level 1	Level 2	Level 3	Level 4	L1-L2	L1-L3	L1-L4	L2-L3	L2-L4	L3-L4
Sustainability	3.88 Aa	3.87 A	3.84 A	3.87 A	0.41	1.60	0.53	4.42	0.15	-1.24
Favorability	3.43 B	3.44 B	3.52 A	3.31 C	-0.37	-2.45*	3.28***	-2.41*	4.00***	7.19***
Purchase Intention	3.00 C	3.15 B	3.24 A	3.01 C	-3.74***	-5.93***	-0.38	-2.48*	3.99***	6.64***

a: Groups with significant differences ($p < .05$) in paired t -tests are indicated by different letters. * $p < .05$, *** $p < .001$

had high favorability scores at lower upcycling stages. In contrast to the minimalist concept, the sporty, feminine, and unique concepts statistically received lower favorability ratings at Level 4, which involves the most remarkable transformation of the original product through upcycling, compared to the other levels. Specifically, the sporty concept had the lowest favorability rating for Level 4 ($M=2.81$).

Purchase Intent The results of the purchase intention evaluation among Gen Z female consumers were similar to the favorability evaluation, but the overall scores were relatively lower. When comparing purchase intention by upcycling stage according to design concept with a paired sample t -test (see Table 6), it was found that the minimalist concept had higher purchase intentions as the upcycling stage increased, with Level 4 ($M=3.92$) and Level 3 ($M=3.81$) receiving the most positive statistical evaluations. Conversely, Minimalist Level 1, which had the most minor product change due to upcycling, scored the lowest ($M=2.51$) in purchase intention among Gen Z female consumers.

When examining the average values by concept, it was evident that Minimalist Level 4 had the highest purchase intention score within the minimalist concept, but it had the lowest score across all concepts and upcycling stages. This suggests that while Gen Z consumers prefer minimalist fashion, the low level of transformation in upcycled fashion products does not necessarily translate into actual purchases. The sporty concept had the highest purchase intentions at Level 2 ($M=3.31$), but the scores decreased with each subsequent level, with the lowest purchase intentions at Level 4 ($M=2.50$). Feminine concepts had the highest purchase intent at Level 1 ($M=3.26$) and Level 3 ($M=3.12$),

while unique concepts had the highest purchase intent at Level 2 ($M=3.60$).

Evaluation by Upcycling Stage

As we previously examined consumer perceptions by upcycling stage for each concept, we aimed to distinguish the differences by upcycling stage clearly. We calculated the average of consumer perceptions for the four stimuli per stage and tested for statistical differences between each stage using a paired sample t -test (see Table 7).

When analyzed by the upcycling stage, Gen Z rated sustainability relatively high for all designs ($M \geq 3.84$), with no statistical difference between each stage, confirming that sustainability evaluations for upcycling are positive regardless of the upcycling stage. When comparing favorability ratings for each upcycling stage, there was no statistical difference between Level 1 ($M=3.43$) and Level 2 ($M=3.44$). Level 3 ($M=3.52$) had the highest favorability ratings, while Level 4 ($M=3.31$) had the lowest. This indicates that Gen Z consumers' favorability of upcycling increases with the level of upcycling, peaking at Level 3, where the product is combined with new elements, and then decreases at Level 4, where the product is completely disassembled and repurposed. This suggests that Gen Z consumers find the design appeal of an upcycled product decreases as the degree of variation increases beyond a certain point.

Intention to purchase, linked to actual purchase, tends to be lower than favorability but follows a very similar trend. Intention to purchase was higher at Level 2 ($M=3.15$) than at Level 1 ($M=3.00$), with the highest intention to purchase at

Level 3 ($M=3.24$), indicating a more positive response as the upcycling stage increases, peaking at Level 3, similar to favorability ratings. Consumers' responses were consistent, with the lowest intention to purchase at Level 4 ($M=3.01$). This suggests that Gen Z consumers favor upcycled products that don't deviate too much from the original purpose of the product but show a clear design variation on the original product. The fact that the lowest intention to purchase scores were at Level 1 and Level 4 suggests that when Gen Z consumers actually purchase upcycled fashion products, they seek products with a visible degree of modification for value and individuality. However, as the upcycling process becomes more advanced and deconstructive, with experimental elements becoming more prominent, it may negatively impact product favorability and purchase intent.

Discussion

This study explored ways to develop sustainable fashion products that can prevent environmental pollution caused by stock clothing and satisfy consumers' aesthetic sensibilities. Upcycled fashion products utilizing stock products were categorized into upcycling stages according to the intensity of product transformation to examine the responses to each stage. Additionally, a design approach was taken to upcycled fashion products by categorizing the upcycling stages by concept to provide direction for their design. To this end, we categorized 459 products from the Korean upcycled fashion brand Re;code into minimal, sporty, feminine, and unique concepts, and surveyed 199 female Gen Z consumers on their perceptions of sustainability, favorability, and purchase intentions. The results showed that consumers responded differently to upcycled products based on the four design concepts.

First, we found that the sustainability, favorability, and purchase intentions of upcycled fashion products that utilize minimalist design increased as the level of upcycling increased. Level 1 had the lowest ratings for sustainability ($M=3.67$), favorability ($M=3.00$), and purchase intention ($M=2.51$). Conversely, Level 4 scored high on sustainability ($M=4.11$), favorability ($M=4.07$), and purchase intention

($M=3.92$). When evaluating the design of minimalist upcycled products, it appears that Gen Z prefers designs that transform and repurpose existing products without making the transformation overtly noticeable. This is evidenced by the lowest positive response at Level 4 for other concepts. We can conclude that Gen Z is positively influenced by the meaning and history of a product through its detailed description, but they prefer products that do not overtly showcase that history in the product design.

Second, sporty designs scored lowest on sustainability, favorability, and purchase intention for upcycled products at Level 4, the highest level of upcycling. Regarding sustainability, Level 3 products, which do not deviate from the original purpose of the sports product but have a significant degree of design modification, had the highest score ($M=3.91$). In terms of likability, Level 1, which has minor material changes, had the highest score ($M=3.63$). However, for purchase intention linked to the actual purchase, Level 2, with partial pattern variations of existing products, had the highest score ($M=3.31$). In contrast to minimalism, Level 4 products received very low favorability ($M=2.81$) and purchase intention ($M=2.50$) scores from Gen Z consumers, suggesting that sporty upcycled fashion design should be presented in a way that does not distract from the practical use of the concept.

Third, the sustainability scores of feminine designs were similar across all four upcycling stages. In the upcycling stages of the feminine concept, Gen Z consumers rated Level 1 and Level 3 products, without excessive pleating or shirring, as more favorable and more likely to be purchased. Gen Z did not favor upcycled fashion products with feminine designs, with the lowest favorability ($M=3.08$) and purchase intentions ($M=2.69$) for Level 2 products that were partially modified by adding large pleats to an existing knit.

Fourth, the sustainability score of unique designs decreased as the level increased, with Level 3, which had a high degree of modification from the original stock form, having the lowest sustainability score ($M=3.64$). Unlike the sustainability scores, Level 2 had the highest favorability ($M=3.82$) and purchase intention ($M=3.60$) scores. However, the scores dropped sharply, with the lowest favorability ($M=3.15$) and purchase intention ($M=2.77$) at Level 4, where

the amount of repurposing of existing inventory and product transformation is very high. This shows that when evaluating upcycled products, Gen Z consumers are inconsistent in their evaluation of the complexity of the design and the degree of transformation for upcycling in unique concept products.

Conclusion

This study aims to provide a practical approach to developing designs for upcycled fashion products that can satisfy consumers' aesthetic sensibilities and secure brand identity, thereby contributing to the growth of the sustainable fashion industry. The study found that the design orientation of the target consumers of sustainable brands should be the most prioritized factor in developing product design for each stage of upcycling. It was also found that providing detailed information about the upcycling process can significantly influence consumers' product evaluation. Information on inventory utilization was identified as a key factor in influencing product purchases, as consumers who are informed about upcycled products evaluate them differently than regular products.

The study found that Gen Z consumers preferred minimalist conceptual designs for upcycled fashion products. They ranked their preferences for upcycled product concepts in the following order: minimalist, unique, sporty, and feminine. In terms of upcycling levels, the originality and uniqueness of Level 3 designs were generally positively evaluated by Gen Z. However, the deconstruction and experimental nature of Level 4 upcycling designs were less favored. This suggests that Gen Z prefers minimalist, unique, and feminine concepts for upcycled products. Minimalist fashion product designs that incorporate upcycling values will most likely be perceived positively by Gen Z consumers. Products with a large proportion of decorative elements or drastically modified clothing patterns had difficulty gaining favor among Gen Z consumers, and products with feminine characteristics also faced challenges. Therefore, when planning upcycled product design, it is necessary to develop a balanced design that appropriately uses feminine elements (pleats, shirring, satin materials, etc.) without excessive

decoration to arouse strong favor and actual purchase intention among Gen Z consumers.

The analysis of upcycling stages by concept showed that the concept of the fashion product more influences Gen Z's actual purchase of upcycled fashion products than the upcycling stage. For sustainable fashion products, if detailed information about upcycled products is excluded, consumers may not distinguish between regular fashion products and upcycled products. They may evaluate the design on the same basis. Therefore, upcycled products need to be differentiated in design to stimulate consumers' desire to buy them. The study also found that Generation Z generally prefers minimalist design when it comes to upcycled products without a clear concept.

The limitations of this study include the following: First, since this study utilized online data of actual Re;code products to increase external validity, it is only possible to partially validate the internal validity of each stage and concept of upcycling. To differentiate the upcycling stages, it was necessary to cross-check Re;code products with their corresponding original products (from other Kolon brands), which significantly limited the options available for use as stimuli. As a result, when selecting products for each concept and upcycling stage, items such as tops, outerwear, dresses, skirts, and pants were mixed. This introduces a limitation as the study could not control for potential bias from item type. Additionally, the validity of the stimuli concepts was assessed only from an expert perspective. If respondents had evaluated the stimuli to verify whether they perceived the intended concepts, the validity of the stimuli could have been further substantiated from a consumer perspective. Further research could address these limitations by developing distinct stimuli for each stage and concept to ensure internal validity.

Second, this study analyzed only women among Gen Z consumers, limiting generalizability to the entire population. A more detailed analysis of the product line for all genders would contribute to developing gender-specific upcycled fashion design preferences. Third, this study categorized upcycled fashion products into four concepts (minimal, sporty, feminine, and unique) and did not include all design details for fashion products with other fashion concepts.

Additionally, since the level of upcycling was determined by analyzing already upcycled products, products with the same design were not evaluated according to the level of upcycling design. Therefore, the influence of the initial design elements (color, material, style, silhouette, etc.) on the final evaluation items, such as likability and purchase intention, cannot be excluded entirely.

This study suggests that the decision-making process for evaluating upcycled fashion products differs from that for purchasing regular products, and further research on the upcycling development stage and purchase decision-making process is needed. Upcycled fashion designers should consider how to maintain their brand identity while reflecting the tastes of their target consumers, which is important for future upcycled design development, and should develop various ways of upcycling stages to continuously acquire customers.

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