# Chapter 1

## EMOTIONAL DESIGN FOR FASHION UPCYCLING

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### *Introduction*

The current 'take-make-dispose' linear model (Ellen MacArthur Foundation, 2017) of the fashion industry urgently calls for a transition to a more sustainable circular system (Moorhouse & Moorhouse, 2017). Statistics indicate that out of the 100 billion garments produced by the fashion industry, 92 million tons of clothing end up in landfill annually (Ruiz, 2023). Around 87% of discarded textiles go to landfill, although more than 90% of them are reusable and recyclable (Moazzem et al., 2021).

Transforming the linear model into a circular system is challenging due to the fast-fashion business model, low-price and low-quality clothing coupled with cultural overconsumption (Tripa et al., 2022). Changing the model is imperative for the fashion and textile industry (Chen et al., 2022). Fashion upcycling is a common and effective solution for reusing many fashion and textile products to reduce negative environmental impacts from direct disposal and elevate their value through recycling (DeLong et al., 2017). By transforming discarded items into higher-value creations (Marques et al., 2019), fashion designers can contribute to sustainable fashion based on their creativity and increase the market competitiveness of their products (Cuc & Tripa, 2018).

Although multiple stakeholders contribute to the fashion upcycling industry, the user plays a decisive role in determining whether to acquire a new garment, dispose of an existing one or upcycle it (Fletcher, 2012). Products that consider consumers' emotional experiences have been mentioned frequently in recent years as consumers are more concerned than ever about their emotional needs when purchasing a product (Karaca, 2020). However, there is limited academic research considering the user's emotional experience in fashion upcycling because the focus of the current study is to understand consumers' attitudes towards upcycling and upcycling willingness (Gwilt, 2021; Kim et al., 2021), introduce fashion upcycling strategies (Gam et al., 2011), indicate the demand and advantages of fashion upcycling (James & Kent, 2019) and identify the barriers to fashion upcycling (Zhang & Hale, 2022).

Emotional design can help products evoke positive emotional responses from users (Norman, 2004). Chapman (2009) proposed an emotionally durable design framework to provide a pathway for product designers to create positive user-product relationships by fostering emotional attachment to the product. Emotional attachment and emotional durability have been discussed in fashion design, but the main focus is understanding why the wearer formed an emotional attachment to their clothing (Niinimäki & Koskinen, 2011). Although in product design, considering the emotional aspect of user experience could contribute to the market competitiveness of the product by increasing its attractiveness, the pleasure during usage and potentially cherishing the product (Norman, 2004), the approach, applicability and impact of emotional design in fashion upcycling remains unclear in academic literature.

Considering the consumer's emotional experience is not a new concept in fashion design (Fletcher, 2012), many fashion retailers have used sensory design to trigger their consumers' emotional responses to boost their brand image (Kim et al., 2019). However, most academic research about emotional design is conducted in generic product design. There is a lack of research regarding the potential benefits or impacts when emotional design theory and principles are applied to fashion upcycling. This chapter focuses on how the different applications and benefits of emotional design theory can assist fashion upcycling practices with different dimensions based on upcycling characteristics, building a bridge between emotional design and fashion upcycling. The application of emotional design in other disciplines was reviewed to provide insights into emotional design practices. Moreover, the relationships between wearers, clothing and fashion upcycling approaches were reviewed to explain the correspondence between emotional design and fashion upcycling.

## Methods

A systematic review of the literature was conducted. The sample of papers was selected from the Web of Science and Scopus databases, as these two databases have been commonly used as primary sources for literature reviews. The exclusion criteria for both Scopus and Web of Science throughout all searches were papers that were not journal articles, not in English, not accessible, or unrelated to fashion or emotion. The first search used 'emotion and design' and 'memory and design' in December 2022. Thirty-seven papers related to design, emotion and design and memory and design were included (Figure 1.1).

In May 2023, a second search was conducted for papers related to emotional design in fashion, resulting in 11 papers (Figure 1.2 left). Another search was conducted in June 2023, using search terms related to 'fashion upcycling and strategies' resulting in 16 papers (Figure 1.2 right).
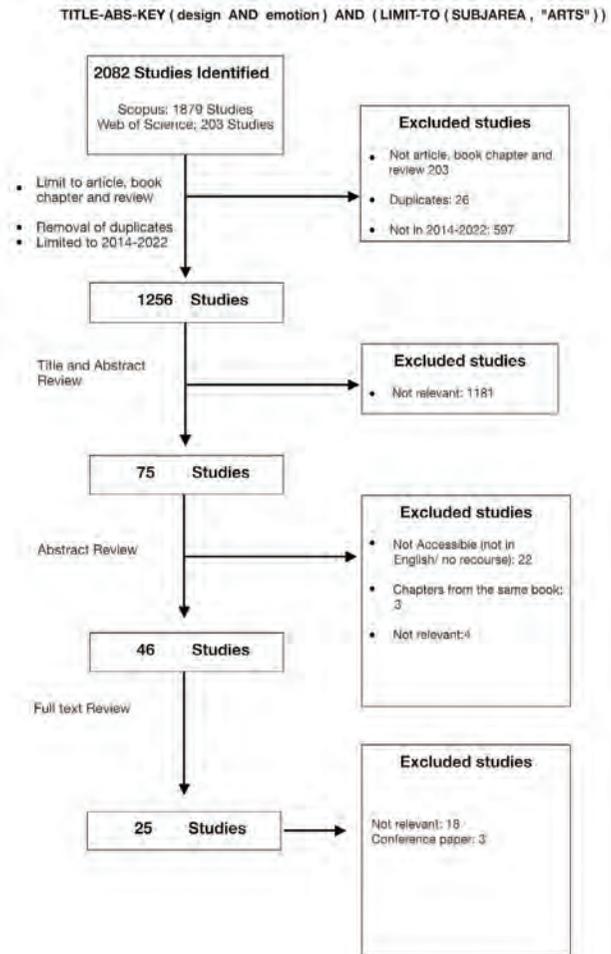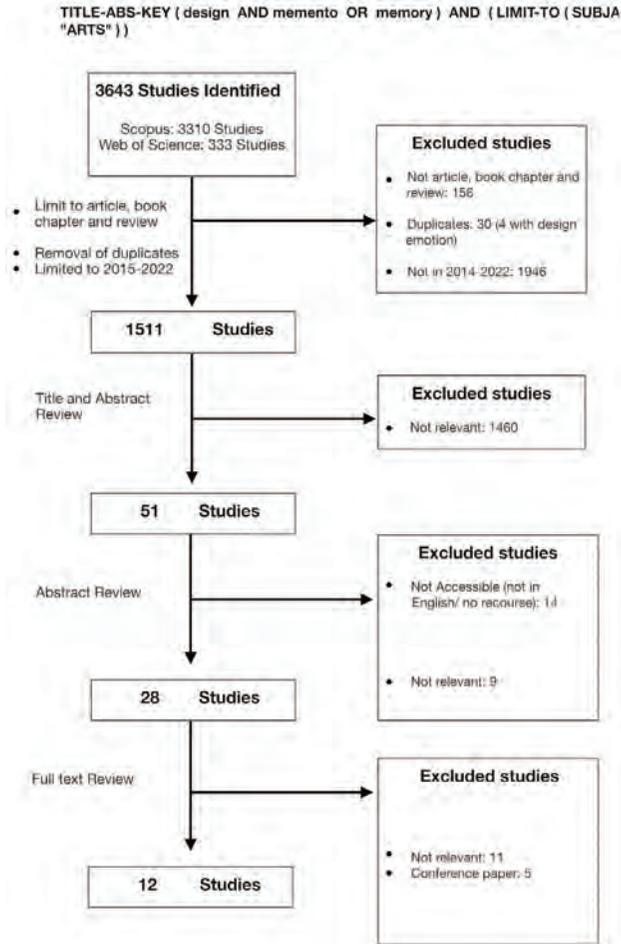
TITLE-ABS-KEY ( design AND memento OR memory ) AND ( LIMIT-TO ( SUBJA "ARTS" ) )

**3643 Studies Identified**

Scopus: 3310 Studies
Web of Science: 333 Studies

- Limit to article, book chapter and review
- Removal of duplicates
- Limited to 2015-2022

**Excluded studies**

- Not article, book chapter and review: 156
- Duplicates: 30 (4 with design emotion)
- Not in 2014-2022: 1946

**1511    Studies**

Title and Abstract Review

**Excluded studies**

- Not relevant: 1460

**51    Studies**

Abstract Review

**Excluded studies**

- Not Accessible (not in English/ no recourse): 14
- Not relevant: 9

**28    Studies**

Full text Review

**Excluded studies**

- Not relevant: 11
- Conference paper: 5

**12    Studies**

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TITLE-ABS-KEY ( design AND emotion ) AND ( LIMIT-TO ( SUBJAREA , "ARTS" ) )

**2082 Studies Identified**

Scopus: 1879 Studies
Web of Science: 203 Studies

- Limit to article, book chapter and review
- Removal of duplicates
- Limited to 2014-2022

**Excluded studies**

- Not article, book chapter and review 203
- Duplicates: 26
- Not in 2014-2022: 597

**1256    Studies**

Title and Abstract Review

**Excluded studies**

- Not relevant: 1181

**75    Studies**

Abstract Review

**Excluded studies**

- Not Accessible (not in English/ no recourse): 22
- Chapters from the same book: 3
- Not relevant: 4

**46    Studies**

Full text Review

**Excluded studies**

Not relevant: 18
Conference paper: 3

**25    Studies**

**Figure 1.1**  Prisma diagram for emotional design.

Scopus: TITLE-ABS-KEY ( affective OR emotion* AND design AND fashion OR apparel )
AND ( LIMIT-TO ( SUBJAREA , "ARTS" ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) )
Web of Science: TS=((affective OR emotion*) AND (design) AND (fashion OR apparel OR
garment OR cloth")) OR TI=((affective OR emotion*) AND (design) AND (fashion OR apparel))
OR AB=((affective OR emotion*) AND (design) AND (fashion OR apparel))

**62 Studies Identified**

Scopus: 50 Studies
Web of Science: 17 Studies

**Excluded studies**

- Not relevant to fashion design

- Did not mention emotion

Title and Abstract Review

**35 Studies**

**Excluded studies**

- Duplicates( include duplicated literature from design emotion & design memory search results: 7

Duplicates literature

**28 Studies**

**Excluded studies**

- Not Accessible (not in English/ no recourse): 8

- Research subject is not related to fashion product (camera; textile museum website; art schema; store design): 4

- Not emotional design: 1
- Conference paper: 1

Abstract Review

**14 Studies**

**Excluded studies**

Article that did not discuss fashion design:

- Computer aided research: 2

- Impulse purchase: 1

Full text Review

**11 Studies**

**482 Studies Identified**

Scopus: 221 Studies
Web of Science: 261 Studies

**Excluded studies**

- Duplicates: 17

**465 Studies**

**Excluded studies**

- Not reuse or not emotion: 401
- Duplicate with design memory:1

Title and Abstract Review

**63 Studies**

**Excluded studies**

- Not Accessible (not in English/ no recourse): 1

- Not include reuse strategies: 36

- Not relevant:1

Abstract Review

**25 Studies**

**Excluded studies**

- Not about up-cycling practice of not about up- cycling strategies: 9

Full text Review

**16 Studies**

**Figure 1.2** Prisma diagram for emotional fashion (left) and Prisma diagram for fashion upcycling (include and exclude emotion) (right).

## *Results*

The searches indicated an uneven distribution in the literature. Most of the papers related to emotional design were conducted in psychiatry, anxiety stress and coping, psychotherapy, audiology and computers in human behaviour. Among the 48 papers identified as relevant to emotional design, most papers (n=37) examined product design, with only 11 on fashion design focusing on understanding wearer-clothing relationships. The search also identified limited results for emotional design in fashion upcycling. Those papers that articulated a theoretical framework for understanding design and emotion tended to adopt the emotional design framework proposed by Norman (2004) to discuss emotional design in fashion upcycling.

### *Theoretical Framework: Emotional Design Theory*

Emotion has the power to influence how individuals perceive and interact with a product and shape an experience (Dewey, 1934). Through emotional design, designers aim to create a deep and meaningful connection between the user and the product by not only meeting the functional needs but also fostering positive and emotional interactions (Norman, 2004). Designers can effectively communicate and express emotions through their creations by carefully considering elements such as shape, colour and texture to evoke positive emotional responses, such as happiness and satisfaction, when using or interacting with the product.

Norman's (2004) emotional design model outlined three levels of how humans process sensory data: visceral, behavioural and reflective. He further indicated that a successful product should elicit positive emotions on these three levels. The visceral level is people's immediate and emotional reaction when they first see the product. At the visceral level, the aesthetic contributes significantly to consumers' emotional reactions, especially for fashion products (Bloch, 1995), as the product's physical features shape the initial impressions towards and attractiveness of a product (Norman, 2004). The next section discusses emotional fashion upcycling based on this model.

### *Emotional Design in the Context of Fashion Upcycling*

*Fashion Upcycling Strategies* Understanding the complexity of upcycling in fashion design (such as fashion's ever-changing trends) and knowledge about consumers' physical and emotional demands regarding upcycled clothing is crucial when reusing materials and minimizing waste effectively. Therefore, practical and user-friendly methods (Kam & Yoo, 2022) for upcycling must be proposed. Common approaches to facilitate this process are such as creative zero-waste pattern cutting, modularization redesign, redesigning, and re-styling.

Creative zero-waste pattern cutting has been used to minimize waste during the pattern-cutting process (Lewis et al., 2017). In the context of fashion upcycling, a zero-waste pattern effectively reuses the patterns from gathered clothing by using computer software such as CAD to optimize the yield of clothing components (Lewis et al., 2017; Cuc & Tripa, 2018; Tripa et al., 2022). Modularization redesign refers to clothing redesign using parts extracted from old garments with the help of digital technology, such as a group genetic algorithm (Paras et al., 2018). Bigolin et al. (2022) approached modularization redesign more artistically and poetically by using cameras to extract and categorize discarded clothing based on their style. Redesigning clothing into other products is also a creative way to upcycle unwanted items. Juciene et al. (2022) redesigned discarded denim into decorative elements and sound insulation in finishing panels for interior design. Cao et al. (2022) repurposed textile waste into products such as phone cases, hats and bags. Re-styling refers to the appearance of clothing that can be altered through various upcycling approaches. For example, the colour can be changed by re-dyeing (Sugiura, 2019) and the structure can be modified by deconstructing and then redesigning the garment or adding decorative elements like embroidery or prints (Bigolin et al., 2022; Paras et al., 2023) to help transform the look of the clothing.

Apart from the approaches listed above, the cultural dimension is important to sustainable fashion design (Kozlowski et al., 2019). In fashion, upcycling involving cultural elements, such as quilting from traditional handicrafts or collaboration with local artisans, could increase the emotional durability of the upcycled product (Kam & Yoo, 2022). Besides, preserving and redesigning based on the unique history of recycled products could be a good promotional strategy for upcycling brands (Deschamps et al., 2017), as retaining the stories and traces of the cloth's previous life has been suggested as a critical requirement for them (Paras et al., 2018).

In summary, fashion upcycling strategies, such as creative zero-waste patterns and modularization redesign, could contribute to optimizing the waste materials. However, relevant design skills and aesthetics are needed to redesign discarded clothing into other products and make them attractive to consumers. Among these strategies, incorporating cultural elements and narratives could evoke emotional responses to the product, discussed in more detail in the following section.

*Wearer-Clothing Relationship in the Context of Upcycling*  Neto and Ferreira (2023) suggest that clothing can be seen as non-human relatives of the wearer, serving as an extension of the self (Belk, 1988). The shared experience between the wearer and the garment creates a significant emotional bond, often driven by the emotions and memories associated with that experience, even though wearers may not always be aware of their emotional attachment towards their garments. The consumer's decision to discard clothing signifies a failed relationship (Chapman, 2007) between them and the garment (Neto & Ferreira, 2023). In an interview with ten women (aged between 29 and 69 in the UK), Burcikova (2019) found that all

of them owned one special dress that was unlikely to be discarded easily. These dresses are special for five reasons: aesthetic, wearability, the memories they evoke in the wearer, making the wearer look and feel good, and cultural elements that contribute to the uniqueness of the clothing, which in turn helps to foster a long-term relationship between the consumer and the garment.

Table 1.1 presents the literature review analysis by identifying factors that influence the aesthetics of clothing. These factors include beauty, style, colour, fit, and tactility (Niinimäki & Koskinen, 2011), as well as the design and placement of clothing components and elements such as silhouette, length, and waist (Qin et al., 2017; Chen et al., 2020a).

The comfort of the clothing material, function, and quality (durability) of the clothing significantly influence the wearer's wearing experience (Niinimäki & Koskinen, 2011; Armstrong et al., 2016), providing a foundation for time long-term use, contributing to consumer satisfaction towards the clothing. An & Lee (2006) further explored Asian women's emotional needs and found that they would pay more attention to the softness and weight of the material. The clothing makes them look and feel good: a sense of satisfaction and delight in the clothes makes them look pretty and attractive (Armstrong et al., 2016), which usually comes from the design or fitness of the clothing and wearing occasions.

Cultural significance has been considered an essential element because some clothing represents cultural symbolism (Liu et al., 2022), such as the embroidery on the Chinese bellyband representing love and family bonds (Hewei, 2023). Clothing evokes many memories, and it 'links to past, present and future' (Niinimäki & Koskinen, 2011, p. 17). It has been argued that this attachment will more likely appear on essential and meaningful objects; therefore, they are unlikely to be discarded. Emotionally meaningful clothing may not be in active use anymore, but the wearer keeps them because of the memories associated with special or meaningful experiences (Niinimäki & Koskinen, 2011; Armstrong et al., 2016). Table 1.2 presents an overview of the analysis of the literature reviewed for emotional values attributed to memories.

**Table 1.1**  Factors influencing the aesthetic of clothing

| Factors | Author and year | Publisher |
|---|---|---|
| Beauty, style, colour, fit and tactility (comfortable material) | (Niinimäki & Koskinen, 2011) | *The Design Journal* |
| Silhouette, clothing length, top fly, collar, waist, hem, pocket, pleat | (Chen et al., 2020a) | *International Journal of Clothing* |
| Shoulder width, shoulder slope, waist ease, waist length | (Qin et al., 2017) | *Journal of Interdisciplinary Mathematics* |

**Table 1.2**  Emotional values attributed to memories

| Emotional values attributed to memories | Author and year | Publisher |
|---|---|---|
| History/past, place, people, moments, childhood; Family ties; Positive associations such as soft tactile feeling | (Niinimäki & Koskinen, 2011) | *The Design Journal* |
| Special occasion, vacation, youth, childhood, a reminder of home, unexpected gift, a reminder of pleasure, a reminder of love obtained for a special occasion, a reminder of youth, the first piece, a reminder of a special person received from a special person; Reference group (family ties, represent a specific thing or people); Expression of self (expression of self, expression of one's ideology, positive association, made for me) | (Armstrong et al., 2016) | *The Design Journal* |

## *Theorizing Emotional Fashion Upcycling Design*

Norman stated that all three levels of design – visceral, behavioural and reflective – are closely interlinked (Norman, 2004). As discussed previously, research related to emotional fashion identified five factors that make clothing special: (aesthetic, wearability, makes the wearer look and feel good, cultural elements and the memories they evoke). Fashion upcycling practitioners should consider different strategies to evoke consumers' emotional responses based on these five factors to increase their satisfaction towards upcycled clothing or products.

In fashion upcycling, the appearance, including silhouette, colour, structure, material, print and decoration of clothing, contributes mainly to the consumer's decision, perception and preference on the visceral level (Niinimäki & Koskinen, 2011; Qin et al., 2017; Sugiura, 2019; Chen et al., 2020b) as the visual attractiveness is a crucial aspect in fashion design (Bloch, 1995; Haug, 2016). Therefore, the visceral level of emotional design can be seen as the appearance of fashion-upcycled products. Fashion upcycling strategies that focus on changing the appearance of clothing, such as redesigning the silhouette, redyeing, and reprinting, could contribute to the consumer's emotional experience and satisfaction with the upcycled product.

Behaviour design aims to create positive emotional experiences to enhance user satisfaction and engagement through the usability and functionality of the product (Norman, 2004); it involves a product's function, understandability, usability, and physical feel. A good behavioural design should be human centred as the designer should consider the actual needs of consumers. It should be user-friendly (easy to use) and can fulfil needs. On the behaviour level, consumers consider clothing quality, fit and comfort as significant factors influencing their wearing experience, and researchers have emphasised their significance as they

determine if users decide to keep or discard the item based on the interviews conducted in European countries (Niinimäki & Koskinen, 2011; Armstrong et al., 2016). Similarly, research based on aesthetic, emotional, expressive and functional emotional needs shows that Asian women tend to evaluate clothing comfort based on factors such as material softness and weight as the standard for fulfilling their functional and emotional needs (An & Lee, 2015). In fashion upcycling, the durability and quality of the clothing influences consumers' attitudes towards it (Niinimäki & Koskinen, 2011; Armstrong et al., 2016). Therefore, the behaviour level of emotional design can be seen as the wearability of fashion-upcycled products. Fashion upcycling practitioners should consider the actual needs of the user and improve the design based on their feedback. At this level, a successful fashion upcycling design should fit the consumer physically and emotionally. In addition to fitness, the design must make the consumer feel confident when wearing it.

The reflective level is related to the meaning of a product the message it conveys, and the personal memory evoked by it. This level involves individuals' deep thinking, evaluation, and reflection on a product, going beyond its appearance and functionality. At this level, factors such as symbolic meaning, cultural significance, personal identity, and memory associated with the product come into consideration. Factors related to how good the consumers look and feel in the clothing also affect their perceptions (Niinimäki & Koskinen, 2011; Armstrong et al., 2016) on the reflective level.

Figure 1.3 illustrates the potential for the use of memory in emotional upcycling fashion design. While memories are subjective and personal, they can potentially be utilised in several design strategies, such as personalized or customized design (Orth et al., 2018), which suggests that users may cherish this clothing more because of its uniqueness. Consumers who DIY old clothing or brands that provide customized services could utilize the memory shared with clothing and translate it into design elements. For bigger-scale upcycling brands, incorporating narratives,
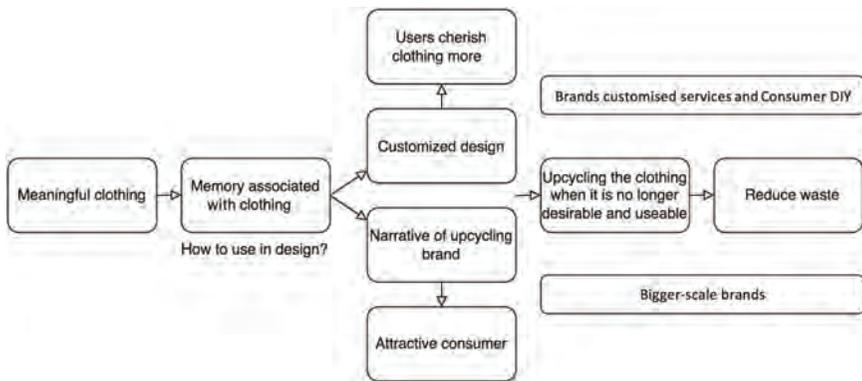


**Figure 1.3** Potential use of memory in emotional fashion upcycling design.

such as designing with the patch from previous use, could also contribute to the brand image and competitiveness as consumers may be attracted by the story of the upcycled fashion items (Deschamps et al., 2017).

Building on Norman's (2004) explanation, researchers have identified that other factors, such as culture and memory, also play an important role in fashion upcycling. However, the wearer's memory associated with clothing is personal and formed through long-time usage; therefore, it is hard to design intentionally. Studies have indicated that the more consumers wear a particular garment, the more beautiful and beloved it becomes (Schifferstein & Zwartkruis-Pelgrim, 2008; Neto & Ferreira, 2023) as that frequent and enjoyable use experience creates meaningful memories (Niinimäki & Armstrong, 2013). Researchers have conducted interviews to examine attachment factors for different types of clothing and found that memory played the most significant role in influencing product attachment in dress and suit (Armstrong et al., 2016). At the same time, factors such as function, emotional value, fit and aesthetics were more important for other types of clothing like T-shirts or jeans. Besides memory, cultural elements can also contribute to the consumer's emotional responses and their emotional attachment to clothing (Kam & Yoo, 2022). In addition, cultural elements in upcycled clothing could also evoke a consumer's emotional response, such as nostalgia. However, this needs to be examined within a specific context as different cultural groups respond differently to cultural products. Accordingly, the reflective level of emotional design can be seen as the emotional satisfaction, memory, narrative and cultural elements provided by the fashion-upcycled product.

## *Conclusion*

This chapter provides insights into the relationship between wearer clothing and fashion upcycling. It aligns emotional design elements in fashion design with fashion upcycling strategies. A widely used emotional design model proposed by Norman (2004) has been introduced and considered in terms of the fashion upcycling process. This study identified five key emotional factors in fashion upcycling design: (i) aesthetic appearance (ii) material and wearability (iii) narrative and memories evoked in the wearer (iv) making the wearer's perception of looking and feeling good, or, emotional satisfaction and (v) cultural elements incorporated into the design. The results show that fashion upcycling neglects consumer's emotional experiences. Incorporating emotional design elements into upcycling could potentially significantly improve consumer emotional attachment to fashion garments and increase emotional durability. As this study used peer-reviewed journal articles as references, it may have overlooked emerging innovative practices. Further empirical studies could enhance understanding of the roles of emotional design, thereby enabling the optimisation of product use and longevity, which could ultimately support alternative ways to advance circular fashion practices.

## *References*

An, H. and Lee, I. (2015), 'A conceptual framework for Asian women's emotional needs in fashion design', *International Journal of Fashion Design, Technology and Education*, 8(3): 206–213.

Armstrong, C.M., Niinimäki, K. and Lang, C. (2016), 'towards design recipes to curb the clothing carbohydrate binge', *Design Journal*, 19(1): 159–181.

Belk, R.W. (1988), 'Possessions and the extended self', *Journal of Consumer Research*, 15(2): 139–168.

Bigolin, R., Blomgren, E., Lidstroem, A., de Oliveira, S.M. and Thornquist, C. (2022), 'Material inventories and garment ontologies: Advancing upcycling methods in fashion practice', *Sustainability*, 14(5): 2906.

Bloch, P. (1995), 'Seeking the ideal form: Product design and consumer response', *Journal of Marketing*. 59: 16–29.

Burcikova, M. (2019), 'One dress: Shaping fashion futures through utopian thinking', *Fashion Practice*, 11(3): 328–345.

Cao, H.T., Cobb, K., Yatvitskiy, M., Wolfe, M. and Shen, H.Q. (2022), 'Textile and product development from end-of-use cotton apparel: A study to reclaim value from waste', *Sustainability*, 14(14): 8553.

Chapman, J. (2007), 'Subject object relationships and emotionally durable design', in T. Cooper (ed), *Longer Lasting Products*, 61–76, London: Routledge.

Chapman, J. (2009), 'Design for (emotional) durability', *Design Issues*, 25(4): 29–35.

Chen, J.Y., Polston, K., Nicols, E. and Phung, B. (2022), 'A study on textile recycling in college student residence areas', *Journal of the Textile Institute*, 113(9): 1854–1861.

Cuc, S. and Tripa, S. (2018), 'Redesign and upcycling – a solution for the competitiveness of small and medium-sized enterprises in the clothing industry', *Industria Textila*, 69(1): 31–36.

DeLong, M., Alice Casto, M., Min, S. and Goncu-Berk, G. (2017), 'Exploring an up-cycling design process for apparel design education', *Fashion Practice*, 9(1): 48–68.

Deschamps, T., Carnie, B. and Mao, N. (2017), 'Public consciousness and willingness to embrace ethical consumption of textile products in Mexico', *Textiles and Clothing Sustainability*, 2: 1–16.

Dewey, J. (1934), *Art as Experience*, New York: Capricorn Books.

Ellen MacArthur Foundation (2017), 'A new textiles economy: Redesigning fashion's future', Available at: https://www.ellenmacarthurfoundation.org/a-new-textiles-economy.

Fletcher, K. (2012), 'Durability, fashion, sustainability: The processes and practices of use', *Fashion Practice*, 4(2): 221–238.

Gam, H.J., Cao, H.T., Bennett, J., Helmkamp, C. and Farr, C. (2011), 'Application of design for disassembly in men's jacket A study on sustainable apparel design', *International Journal of Clothing Science and Technology*, 23(2–3): 83–94.

Gwilt, A. (2021), 'Caring for clothes: how and why people maintain garments in regular use', *Continuum*, 35(6): 870–882.

Haug, A. (2016), 'A framework for the experience of product aesthetics', *Design Journal*, 19(5): 809–826.

Hewei, T. (2023), 'Chinese folk embroidery bellyband: The intersection of loving symbol, emotional release, and spiritual needs', *Textile: The Journal of Cloth and Culture*, 22(1): 84–101.

James, A.S.J. and Kent, A. (2019), 'Clothing sustainability and upcycling in Ghana', *Fashion Practice*, 11(3): 375–396.

Juciene, M., Dobilaite, V., Albrektas, D. and Bliudzius, R. (2022), 'Investigation and evaluation of the performance of interior finishing panels made from denim textile waste', *Textile Research Journal*, 92(23–24): 4666–4677.

Kam, S. and Yoo, Y. (2022), 'Practice of sustainable fashion design considering customer emotions and personal tastes', *Frontiers in Psychology*, 13: 976471.

Karaca, E. (2020), 'Emotional landscape design through Kansei/affective engineering', in M. Özyavuz (ed), *Theory and practice in sustainable planning and design: Planning, design, applications*, 429–444, Berlin: Peter Lang.

Kim, I., Jung, H.J. and Lee, Y. (2021), 'Consumers' value and risk perceptions of circular fashion: Comparison between secondhand, upcycled, and recycled clothing', *Sustainability*, 13(3): 1208.

Kim, Y.K. and Sullivan, P. (2019), 'Emotional branding speaks to consumers' heart: the case of fashion brands', *Fashion and Textiles*, 6(1): 1–16.

Kozlowski, A., Bardecki, M. and Searcy, C. (2019), 'Tools for sustainable fashion design: An analysis of their fitness for purpose', *Sustainability*, 11(13): 3581.

Leerkes, E.M. and Siepak, K.J. (2006), 'Attachment linked predictors of women's emotional and cognitive responses to infant distress', *Attachment and Human Development*, 8(1): 11–32.

Lewis, T.L., Park, H., Netravali, A.N. and Trejo, H.X. (2017), 'Closing the loop: a scalable zero-waste model for apparel reuse and recycling', *International Journal of Fashion Design, Technology and Education*, 10(3): 353–362.

Liu, H., Wang, Y., Huang, Z. and Romainoor, N.H. (2022), 'A study on the attractive quality attributes of Guochao T-shirt products based on consumer emotional experience', *Journal of Silk*, 59(2): 55–67.

Marques, A., Moreira, B., Cunha, J. and Moreira, S. (2019), 'From waste to fashion – a fashion upcycling contest', *Procedia CIRP*, 84: 1063–1068.

Moazzem, S., Wang, L., Daver, F. and Crossin, E. (2021), 'Environmental impact of discarded apparel landfilling and recycling', *Resources, Conservation and Recycling*, 166: 105338.

Moorhouse, D. and Moorhouse, D. (2017), 'Sustainable Design: Circular Economy in Fashion and Textiles', *Design Journal*, 20(sup1): S1948–S1959.

Neto, A. and Ferreira, J. (2023), 'Lasting bonds: Understanding wearer-clothing relationships through interpersonal love-theory', *Fashion Theory – Journal of Dress Body and Culture*, 27(5): 677–707.

Niinimäki, K. and Armstrong, C. (2013), 'From pleasure in use to preservation of meaningful memories: A closer look at the sustainability of clothing via longevity and attachment', *International Journal of Fashion Design, Technology and Education*, 6(3): 190–199.

Niinimäki, K. and Koskinen, L. (2011), 'I love this dress, if makes me feel beautiful! Empathic knowledge in sustainable design', *Design Journal*, 14(2): 165–186.

Norman, D.A. (2004). *Emotional Design: Why We Love (Or Hate) Everyday Things*, New York: Basic Books.

Orth, D., Thurgood, C. and van den Hoven, E. (2018), 'Designing objects with meaningful associations', *International Journal of Design*, 12(2): 91–104.

Paras, M.K., Pal, R. and Ekwall, D. (2023), 'An exploratory study of Swedish and Romanian organisations to investigate upcycling practice in the clothing industry', *Research Journal of Textile and Apparel*, Vol. ahead-of-print (No. ahead-of-print).

Paras, M.K., Wang, L.C., Chen, Y., Curteza, A., Pal, R. and Ekwall, D. (2018), 'A sustainable application based on grouping genetic algorithm for modularized redesign model in apparel reverse supply chain', *Sustainability*, 10(9): 3013.

Qin, F., Jiang, Y. and Liu, G.L. (2017), 'A behavior experiment study: Information integration in sensory perception of female suit silhouettes', *Journal of Interdisciplinary Mathematics*, 20(1): 243–254.

Ruiz, A. (2023), '17 Most Worrying Textile Waste Statistics & Facts', Available at: https://theroundup.org/textile-waste-statistics/ (accessed 28 June 2023).

Schifferstein, H.N.J. and Zwartkruis-Pelgrim, E. (2008), 'Consumer-product attachment: Measurement and design implications', *International Journal of Design*, 2(3): 1–13.

Sugiura, M. (2019), 'The mass consumption of refashioned clothes: Re-dyed kimono in post-war Japan', *Business History*, 61(1): 106–121.

Tripa, S., Indrie, L., Zlatev, Z. and Tripa, F. (2022), 'Customized clothes – a sustainable solution for textile waste generated by the clothing industry', *Industria Textila*, 73(3): 275–281.

Zhang, L.S. and Hale, J. (2022), 'Extending the Lifetime of Clothing through Repair and Repurpose: An Investigation of Barriers and Enablers in UK Citizens', *Sustainability*, 14(17): 10821.