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# Towards Design Recipes to Curb the Clothing Carbohydrate Binge

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**ABSTRACT** The clothing industry is currently characterized by a fast metabolism, utilizing many resource inputs yet creating few productive environmental or social outputs. The concept of fashion is utilized by the clothing industry like an excess dose of carbohydrates, yielding a short-term high followed by an energy deficit that can only be satisfied by consuming again. The use of emotional

**attachment as design strategy may enhance the sustainable consumption of clothing, but contextual understanding is needed. This qualitative study explored the contextual nature of clothing attachment, specifically examining the potential of this strategy to meet sustainability aims. The researchers use this investigation to propose two sustainable design recipes: designing for continual engagement, and designing for end-of-life value.**

KEYWORDS: clothing, emotional attachment, sustainable design

### Introduction



One of the most perplexing social issues associated with the clothing industry is the extent to which superfluous consumption of material things, such as clothing, has become recreational. Today, consumption activity more frequently replaces social engagement, the portal through which fundamental human needs are most effectively satisfied (Briceno and Stagl, 2006). Although the consumption of material goods is often associated with happiness, that association is only relevant to the fulfilment of basic levels of well-being, after which a converse relationship is found (Max-Neef, 1985). In fact, the more material goods are utilized to attempt satisfaction of non-material needs, the more dissatisfied the consumer may become (Belk, 1985; Briceno and Stagl, 2006).

Fletcher (2010) compares this phenomenon in fashion clothing to a set of values very similar to the fast food industry: a system that churns out a high volume of cheap, low-quality, and homogenous offerings that drive economic growth in the short term, meanwhile stacking up many social and ecological consequences. Fletcher and Grose (2012) later introduced the concept of wardrobe metabolisms, exploring both the speed and time with which garments are consumed. This exploration identified possibilities for achieving a better balance between fast and slow clothing consumption, examining different methods by which garments may be made more appropriately durable; from practices that support longevity to designing for low-impact disposability (Fletcher and Grose, 2012). Akin to the advent of the Slow Food movement in Italy that emphasized a set of values including good health, slow fashion generally promotes greater responsiveness to human needs via methods that limit the social and ecological consequences; not by small adjustments to the current model, but by re-conceptualizing the values and goals that perpetuate unhealthy priorities (Fletcher, 2010). Although the argument Fletcher (2010) makes is in regard to the larger system, this paper extends this analogy to the micro-level: the impact of these value systems, fast and slow, on the individual.

Arguably, the current system is dominated by a fast metabolism that utilizes many inputs and results in few productive environmental

or social outputs (Fletcher and Grose, 2012). The concept of fashion is utilized in the clothing industry like a dose of excess carbohydrates injected into the human metabolism; a spike of pleasure and relief from stress experienced through newness and change (Berthoud, 2012; Walker, 2009). But soon, a hangover occurs when interest is systematically shifted to the next new thing by design practice (Berthoud, 2012; Walker, 2009), similar to a dramatic reduction in blood sugar level that leaves the body with an energy deficit that may only be filled by once again seeking the high of newness (Richins, 2009).

Carbohydrates are not inherently unhealthy, but without intelligent choices and moderation, excess carbohydrates can be stored rather than utilized productively, leading to chronic disease (Jenkins *et al*, 1982). One reason for this occurrence may be attributed to food intake that is based on conditioning (seeing, smelling, or even thinking about food) rather than metabolic need (Berthoud, 2012). A similar argument may be made for the current pattern of clothing consumption that is emerging concomitant with the fast fashion industry. Quantity rather than quality, want rather than need, are central (Fletcher, 2010). Yet, in the carbohydrate milieu, there is a difference in the digestion rates and energy gained from a complex carbohydrate such as vegetable or legume versus a confection, each with very different post-consumption consequences (Jenkins *et al*, 1982). For instance, Patagonia, the US outdoor retailer, recently made a plea with its customers to encourage responsible and intelligent consumption of clothing, purchasing quality and purchasing for need rather than wants only. This paradigm is not a mandate for consumption avoidance, but of more mindful consumption that prompts a healthier and more satisfying experience while eliminating injurious by-products (Fletcher, 2010).

Emotional product attachment is increasingly associated with sustainable consumption initiatives; attachment is a gateway to reducing the production, consumption, and disposal of consumer goods while better delivering human satisfaction (Mugge *et al*, 2006), and a potential mechanism to better pace the wardrobe metabolism (Fletcher and Grose, 2012). Yet, enduring emotional attachment to clothing is low by design. The volume of clothing produced is ever-increasing while its quality and price are decreasing (Cachon and Swinney, 2011), dramatically shortening the average life of products (Bianchi and Birtwistle, 2010; Birtwistle and Moore, 2007).

Recently, a study conducted in Finland identified determinants of emotional attachment to textile products, the findings of which included both functional (e.g. quality, fit, aesthetical) and emotional (e.g. memories, self-expression) aspects (Niinimäki, 2010; Niinimäki and Koskinen, 2011). Design strategies thought to strengthen attachment to clothing products were proposed, such as improving performance and aesthetical features of design to increase satisfaction

as well as emphatic approaches like co-design (Niinimäki and Koskinen, 2011). However, design strategies for emotional attachment are complicated by the dynamic nature of attachment and its reliance on the continual elicitation of positive feelings (Ball and Tasaki, 1992), for which frequent use is considered an important channel (Baldwin *et al.*, 1996; Kleine and Baker, 2004; Mugge *et al.*, 2006). The degree of attachment also varies depending on the type of object (Ball and Tasaki, 1992). It is difficult to conceptualize how a designer may facilitate this phenomenon without ample contextual information. The functional and expressive purposes of clothing complicate the development of emotional history required for attachment. Recent research has also shown that clothing attachment can remain stable even if the item is stored (Niinimäki and Armstrong, 2013).

The purpose of this study was to explore the contextual nature of attachment to clothing, specifically examining the potential of attachment as design strategy to meet sustainability aims. The researchers conducted a survey and examined accounts by 401 men and women with declared attachment to a clothing item. The study sought to understand the attachment experience among respondents by identifying the determinants most associated with specific clothing product types, then examining the use frequency and length of ownership associated with that attachment experience. In the following, a theoretical foundation about product attachment and sustainability is introduced, preceded by an outline of the study's investigation. Finally, potential design solutions that may better pace the wardrobe metabolism and curb the current clothing carbohydrate binge are suggested, which narrow the designer's scope to develop solutions responsive to types of sustainable design challenges for specific types of clothing.

### **Product design, attachment, and sustainability**

Csikszentmihalyi and Rochberg-Halton (1981) argue that possessions are important for their instrumental value (to manipulate our environment) as well as their symbolic value (to express ourselves). Product attachment is the emotional bond that develops over time between an individual and a possession, developed by the meanings individuals assign to it, and entirely controlled by the individual's thoughts, feelings, and behaviours toward the object (Ball and Tasaki, 1992; Schultz *et al.*, 1989). Belk (1988) explains that attachment occurs when individuals invest psychic energy (effort, time, attention) in objects. This energy and its products are regarded as a part of the self.

Attachment is experienced in degrees of strength and is dynamic (Ball and Tasaki, 1992; Myers, 1985; Schultz *et al.*, 1989), making it a difficult attribute to control in design. The degree of attachment strength is reliant on the extent to which an object is owned, is

expected to be owned, or has been previously owned for supporting an individual's self-concept (Ball and Tasaki, 1992; Belk, 1988; Schultz *et al*, 1989; Sivadas and Machleit, 1995). Stronger attachments are most frequently associated with objects that are perceived as a part of the extended self: objects that yield the greatest psychic and emotional energy (Belk, 1987). Attachment is characteristically associated with an object rather than a product category or brand and devoid of perceived market value, being irreplaceable. Attachment is also multi-faceted, derived from both public (approval of others) and private (internal gratification) origins and results from a personal history with the object through rituals (real and imagined) over time (Kleine and Baker, 2004). Positive emotions are most often associated with attachment; however, emotions change rapidly and can be elicited even without direct contact (Schultz *et al*, 1989). Therefore, the key to attachment is the continual production of positive emotions toward the product, developed through a variety of experiences that vary by object type (Ball and Tasaki, 1992).

Much research has explored possible determinants of product attachment, often derived through *pleasure and enjoyment*: (1) pleasure derived from the product's primary function – like a product that helps you relax, recreate or entertain, or (2) the product's superior utility (aesthetics, features, usability, high quality). The implication is that well-designed products that perform in a superior way and embody unique functional and aesthetic features encourage attachment (Mano and Oliver, 1993). Obviously, these features may lead to fashion changes and replacement. Some authors recommend designing for continual pleasure-eliciting attributes to make attachment more enduring. This removes the competition of other products, the consumer more inclined to continue the relationship. One suggestion is to create products that surprise the consumer (Mugge *et al*, 2008).

Another determinant of attachment is *self-expression* and *self-identity*, supporting one's sense of identity, fostering attachment. Products designed with pre-determined personalities in mind may manifest in a variety of shapes, materials, textures, and colours (Govers and Mugge, 2004; Mugge *et al*, 2006; Richins, 1994). Mugge *et al*, (2006) found that although consumers are more attached to personality-congruent products, this only leads to an extension of the product's life for consumer introverts (for whom fashion is unimportant). Thus, classic designs may support product longevity. Schoormans and Mugge (2006) found that consumers are more attached to things they are able to personalize, firmly cementing the product's meaning to the object. These authors suggest an emphasis on use experience. Likewise, Mugge *et al*, (2009) found that effort invested directly impacts attachment and indirectly affects the product's expressive value. The more time spent personalizing (mental and physical labour), the higher the self-expressive value and attachment. Additionally, self-expression and group affiliation

are strongly correlated (Mugge *et al*, 2008). Design strategies that encourage social contact via sharing or group use have led to attachment.

*Memories* associated with product experiences over time also contribute significantly to attachment (Baldwin *et al*, 1996; Kleine and Baker, 2004), based on memories of previous self-definitional experiences or anticipated ones (Schultz *et al*, 1989). Designing products that age with dignity (showing wear and tear) may foster attachment (Mugge *et al*, 2008). Importantly, research demonstrates that product usage is a key conduit for memory-making (Mugge *et al*, 2006).

Attachment may be fostered through a variety of object experiences, whether through some type of control, mastery, or domination, or by creating the possession (physically or mentally), and the attachment varies by object type (Ball and Tasaki, 1992). The environmental benefits from strengthening the perceived irreplaceability of consumer products may manifest from slowing production and reducing disposal. The use of attachment in design may also demonstrate social benefits by improving a consumer's state of well-being and happiness through a deeper emotional relationship with owned objects, a relationship less beholden to the concept of fashion. Yet, how the designer may influence this dynamic and organic process remains unclear.

### ***Emotional attachment and clothing***

Clothing choices externalize the inner self in regards to identity, sexuality, and sociality (Woodward, 2005) and have been found to be the most common type of product to serve self-identity (Hirschman and LaBarbera, 1990). Clothing is also an important prompt to autobiographical memory rehearsal (Kleine, 2000) that fades in significance when compared to other mementos depending on one's level of involvement. In a longitudinal study conducted by Csikszentmihalyi and Rochberg-Halton (1981), clothing ranked comparatively low among frequently mentioned special objects like furniture, visual art, musical instruments, books, and photos. Although younger participants and females more often cited clothing as a special object, clothing was entirely absent from the most frequently cited objects in which meaning-making was high. This latter finding is likely associated with the clothing industry's short-term intention and fast metabolism, a chief barrier to enduring attachment. Further, Bloch (1982) found that end users of automobiles and clothing who were highly involved with each of these product categories were more likely to use those types of objects to project and enhance their self-image.

In the aforementioned study about textile products, most of which were clothing, aesthetical and functional aspects such as beauty, style, and timeless design as well as fit, quality, functionality, and reparability contributed to pleasurable use experiences,

leading to attachment (Niinimäki and Koskinen, 2011). Study participants also frequently cited design attributes that contributed to the user's sense of self, such as uniqueness, being custom-made, or those representing the user's personal ideology. Some participants discussed how their level of effort in designing a textile item also contributed to self-expression. Finally, participants cited a variety of memory associations, including special places, people, moments, family ties, or positive associations with a sense of safety through soft tactile feeling (Niinimäki, 2010; Niinimäki and Koskinen, 2011).

### Materials and methods

In the current study, the determinants of emotional attachment to clothing were explored once again, but with greater examination of product type, frequency of use and ownership length. The attachment experience was examined by identifying the attachment determinants, and then the use frequency and length of ownership associated with that attachment, scrutinizing the potential of attachment as design strategy to meet sustainability aims.

In the previous Finnish study, respondents completed an open-ended survey to describe their oldest textile product and provide a story about their product attachment (Niinimäki, 2010; Niinimäki and Koskinen, 2011). The sample was largely comprised of young females, many associated with the design profession. The current study sought a more representative sample, including older consumers and men. The researchers also asked participants to discuss products to which they proclaimed attachment, allowing greater potential to observe varying lengths of ownership.

An online open-ended survey was developed, prompting respondents to describe a clothing item to which they felt particularly attached. Fine jewellery was excluded from these discussions, being considered a special possession. Survey items required the frequency of use (daily, several times a week, several times a month, rarely, or never), length of ownership (open-ended; months and years), and the method of acquisition (purchased new, gift, hand-me-down or inheritance, second-hand, lost and found, or other). Finally, demographic information was requested.

The sample was recruited by an online research firm in the USA. Individuals invited to participate in the study were pre-validated and had a pre-existing relationship with the firm. Using a by-invitation-only panel recruitment model enabled the researchers to yield the highest level of panel quality and representation while guarding against duplication, fraudulent respondents, and professional survey-takers. Quota limits were utilized for age and gender to ensure a broad age range and a balanced split between genders. The survey yielded 401 usable surveys from 598 surveys begun or partially completed. Approximately 45% of the sample was male and ranged in age from 18 to 67: 18–24 (7.5%), 25–34 (27.4%), 35–44 (23.5%),



45–60 (28.1%), and over 60 (13.5%), most of whom were Caucasian/white (88.0%) and had completed a college degree (66.1%).

A content analysis of the survey responses was conducted using Nvivo 10 research analysis software, which facilitated the identification of power among attachment themes as well as classification of the data by age group, gender and product type. Respondents frequently cited more than one reason for their attachment, thus references rather than respondents were calculated to identify theme power. Descriptive statistical calculations were conducted to discern frequency of use and length of ownership by product category type as well as to examine potential gender and age differences among responses.

### Findings

The justifications given by participants for their attachment to clothing items emerged from two primary origins: good design as well as emotional and experiential determinants, consistent with previous research (Niinimäki, 2010). The most frequently cited themes were functionality and emotional values (Table 1). Evidencing less power, but still frequently cited, were style, fabric and material, pleasure, and some references to effort invested.

No real differences were observed among the various age groups, although some mentionable gender differences were found. Women referenced functionality aspects (utility, multi-functionality) nearly twice as often as men. Similarly, women cited fabric and material aspects more frequently, particularly aspects such as colour and tactile qualities. Women discussed emotional dimensions of their attachment at twice the rate of men; specifically, memories, as well as the pleasure associated with being complimented on an item, or effort invested. On the other hand, men more often discussed feeling relaxed in the garment as a reason for attachment. This comparison should be viewed with caution, as there were slightly more women in the sample than men.

When examining acquisition method, length of ownership, and frequency of use, it was discerned that most of these items had been purchased new (67.5%), although some had been received as a gift (19.2%), and less than half of the items had been owned for more than 6 years, with ownership ranging from less than one year (7.7%) to more than 25 years (10.2%). Further, approximately 40% of the items were used only a few times a year or not at all. Clearly, attachment to clothing is complex and does not necessarily require a historical reference, a long period of time, or frequent use to develop. Thus, a variety of other contextual conditions may provide a clearer explanation.

The clothing product type itself may be an important contextual condition for attachment (Ball and Tasaki, 1992). Two of the most frequently cited clothing categories were T-shirts or sweatshirts

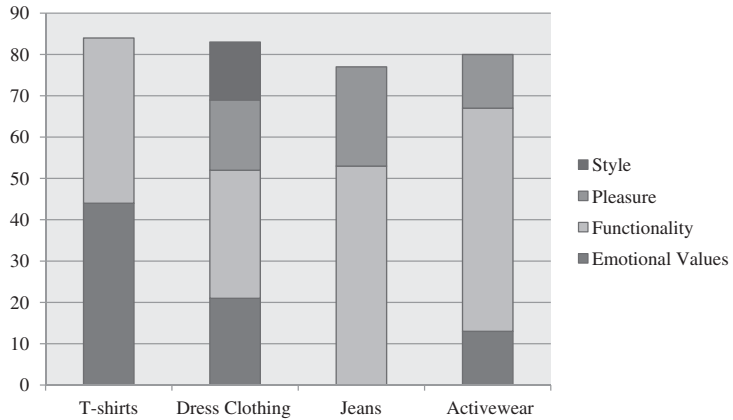
**Table 1.** Determinants of emotional attachment to clothing.

<i>Determinant</i>		<i>Description</i>	<i>#</i>	<i>Total</i>
Good design	Functionality	Comfortable	139	334
		Good fit	100	
		Utility (good for sports, hide body deformation, easy to match, easy to care, easy to put on) <sup>W</sup>	47	
		Warm	19	
		Multi-functionality (casual or dressy, every season) <sup>W</sup>	18	
		Durable	7	
		Well made (high quality in manufacturing)	4	
	Style	Beautiful, pretty, cool-looking, picture on it	50	77
		Stylish	10	
		Uniqueness <sup>W</sup>	10	
		Classical and timeless	7	
	Fabric and material	Nice colour <sup>W</sup>	23	61
		Tactile feeling (silky, soft) <sup>W</sup>	17	
		Fabric aesthetic (not thick, light-weight, sparky)	14	
		Flexible (not stretched)	4	
Durable (high quality in material)		3		
Emotional and experiential	Emotional values	Memories (special occasion, vacation, youth, childhood, remind of home, unexpected gift, remind of pleasure, remind of love, get it from special occasion, remind of youth, the first piece, remind of special person, get it from special person) <sup>W</sup>	194	223
		Reference group (family ties, represent specific thing or people)	22	
		Expression of self (Express of self, expression of one's own ideology, positive association, made for me)	7	
	Pleasure	Look good in it	49	104
		Feel good in it	24	
		Get complimented on it <sup>W</sup>	14	
		Feel relaxed in it <sup>M</sup>	6	
		Bring good luck	4	
		Love the brand	3	
		Made me happy	2	
	Effort invested	The best piece	2	14
Reward for self		8		
Hand-made <sup>W</sup>		6		

<sup>M</sup>most frequently cited by men;<sup>W</sup>most frequently cited by women.

**Figure 1.**

Top determinants of emotional attachment for most frequently cited product categories.



( $n = 141$ , 35.1%) and Dress Clothing ( $n = 97$ , 24.1%), both experiencing long ownership periods (T-shirt/Sweatshirt,  $M = 11$  years; Dress Clothing,  $M = 9.659$  years; Table 2) but different use patterns. On the other hand, Jeans or Casual Bottoms ( $n = 52$ , 12.9%) and Activewear (for exercise;  $n = 50$ , 12.5%) were cited at a moderate rate, but conversely experience more frequent use and shorter ownership (Activewear,  $M = 5.735$  years; Jeans or Casual Bottoms,  $M = 5.398$  years) by comparison. This is understandable when considering the memento a T-shirt can become, or the quality and durability embodied by a suit or dress compared to the high use intensity of a workout suit or pair of jeans that results in the degradation of the item, leading to disposal and replacement.

Significantly fewer participants were attached to Outerwear (e.g. coats, leather jacket;  $n = 12$ , 3%), Sleepwear or Lingerie ( $n = 13$ , 3.2%), or Accessories ( $n = 13$ , 3.2%), all of which experience long ownership periods and frequent use. From a sustainability perspective, these latter product categories do not merit nearly as much attention as the former product categories that evidence discord in use frequency and time of ownership. The latter already evidences a long and active relationship, while the former exhibits potential issues such as short lifetimes, lack of use, and storage requirements.

To better understand the emotional attachment associated with the most frequently cited products, the researchers sorted the top four product categories by attachment determinant (Figure 1). In the T-shirt/Sweatshirt category, many items were T-shirts and jerseys ranging from branded or sports-related items, such as a 'Vikings sweatshirt', 'Timberland shirt', a 'blue hoodie from Abercrombie' to event-oriented clothing such as 'Ohio State Final Four T-shirt'. There were also a variety of nondescript T-shirts and sweatshirts, described as 'navy blue hoodie' or 'green T-shirt'. Emotional values (44%) and functionality (40%) were similarly referenced as justification for attachment. Upon closer examination of the sub-categories of these determinants, memories were most associated with the

**Table 2.** Use frequency and length of ownership by product category.

Product category	N*	Frequency of use (%)					Length of ownership			
		Daily	Several times a week	Several times a month	Several times a year	Rarely	Never	Min	Max	M
T-shirt/sweatshirt	141	1.4	18.2	38.3	19.9	12.1	9.9	0.2	44	11.000
Dress clothing	97	1.0	10.3	33.0	35.1	13.4	7.2	0.3	50	9.659
Jeans/c. bottoms	52	3.8	48.1	30.8	5.8	7.7	3.8	0.2	35	5.398
Active wear	50	12.0	32.0	44.0	6.0	2.0	4.0	0.5	30	5.735
Accessory	13	30.8	30.8	30.8	0.0	7.7	0.0	0.5	31	7.346
Sleepwear/lingerie	13	30.8	30.8	15.4	7.7	0	15.3	3	23	10.022
Outerwear	12	0.0	25.0	25.0	33.3	8.3	8.3	1.5	44	15.875

\*Other = 23 items (casual sweaters, shoes, apron, wedding dresses).

item's emotional value, while comfort and good fit contributed most to the functionality determinant. Although more than half of these items were used frequently, many had been relegated to infrequent engagement or saved as mementos.

Although items of Dress Clothing, including suits and coordinating separates such as blouses and dress shirts, as well as dresses, experienced a long ownership time ( $M = 9.659$  years), over half of these items were not worn more than a few times a year, the most frequently cited determinants of emotional attachment being functionality (31%), emotional values (21%), pleasure (17%), and style (14%). When examining the sub-categories of these determinants, comfort and good fit contributed most to the functionality determinant, while memories most contributed to emotional values. Looking good in it contributed most to the pleasure determinant, while good design contributed to style. In sum, participants were attached to Dress Clothing when it provided comfort and good fit, and these good design attributes also contributed to pleasure. Some participants also perceived these items as memory keepers when worn for a special or momentous occasion, which explains the long life but lack of use.

In the Jeans or Casual Bottoms category, most of these items were denim jeans, for which some participants also included brand names. These items generally were reported to experience frequent use but a shorter ownership period ( $M = 5.398$  years). The most frequently referenced justifications for attachment were functionality (53%) and pleasure (24%). Good fit and comfort contributed most to functionality, while looking good in it most contributed to pleasure. In sum, although these items were not necessarily owned a long time, active engagement was found, for which good design and contribution to the attractiveness of the wearer were considered essential.

Finally, in the Activewear category, most items were tops and shorts worn for workout activities such as tank tops, 'yoga pants', and 'basketball shorts'. Like the Jeans or Casual Bottoms category, these items experienced frequent use but a shorter ownership period ( $M = 5.735$  years). Functionality (54%), emotional values (13%), and pleasure (13%) were the most frequently referenced determinants of attachment. Comfort, good fit, and utility most contributed to functionality, while memories contributed to emotional values for some and looking good in it also contributed to pleasure. Clearly, functionality is key when developing emotional attachment to active wear for which good design is essential. This is understandable considering the performance expectations of these garments.

## Discussion and implications

If one wanted to modify their carbohydrate consumption, they may first examine the type and amount of carbohydrates consumed and the consequences of each choice (Jenkins *et al.*, 1982). Likewise,

Fletcher and Grose (2012) argue that if consumers could become aware of their wardrobe metabolisms (fast and slow), they may be empowered to adjust them. The same could be said for the designer's awareness. Therefore, the chief objective of this study was to investigate the contextual nuances involved in attachment experiences for the purpose of strengthening the designer's sustainable design repertoire. Importantly, this study's findings support the contention that simply knowing the determinants of emotional attachment for clothing does not inherently lend itself to design strategy. Many items discussed by participants as objects of attachment were purchased new, owned for less than six years, and were used infrequently, debunking nearly every theory about emotional product attachment and its role in achieving sustainable design. Upon closer inspection, a number of contextual issues were examined that could assist the designer in conceptualizing sustainable design for clothing. The findings extend the *Lifetimes* project by Fletcher and Tham (2004) that categorized clothing into slow and fast metabolisms. A slow metabolism was characterized by classic and basic clothing items that experience long ownership and frequent use, while a fast metabolism was characterized by fashion items that experience short or one-time use. This concept is now extended by the emotional experience associated with these product types, providing more contextual understanding.

Although no age differences among the determinants of product attachment were observed, women made more frequent mention of functionality aspects such as utility and multi-function as well as fabric, colour, and the tactile quality at a much higher rate than did men. Women also more frequently discussed emotional dimensions of their attachment, such as memories, as well as pleasure associated with being given a compliment about the item. Previous authors have found that females generally are more likely to mention clothing as a special object (Csikszentmihalyi and Rochberg-Halton, 1981), fuelled by a higher level of involvement with the product category (Bloch, 1982; O'Cass, 2004), and the majority of annual household expenditures on clothing in the US (approximately \$1,700) are spent on clothing for women over the age of 16 (US Bureau of Labor Statistics, 2012). These facts increase the sense of urgency to pursue sustainable design strategies targeting the female population, an area where consumption is ever-increasing and sustainable consumption is needed.

The product types in question and their associated use pattern and ownership length illustrate some contextual factors that may focus sustainable design energy. The four most frequently cited product categories (Figure 1) seemed to define two primary sustainability challenges in need of different metabolic approaches: (1) products that experience lengthy ownership but evidence infrequent use that leads to storage (T-shirts/Sweatshirts and Dress Clothing), and (2) products that experience only moderate to shorter lengths of

**Table 3.** Design recipes to curb the clothing carbohydrate binge.<sup>1</sup>

<i>Design recipe</i>	<i>High dietary quality</i>	<i>Have your cake and eat it, too</i>
Current clothing metabolism	Long owning time; propensity for infrequent use and storage	Short to moderate owning time; frequent use
Clothing attributes	High symbolic value Self-expression; autobiography keeper	High instrumental value Helps user do; channel for lived experience
Clothing examples	T-shirts/Sweatshirts	Jeans/Casual Bottoms Activewear
Primary determinants of emotional attachment	Emotional values (memories)	Functionality (comfort, good fit, utility)
Sustainability challenge	Functionality Product disengagement or mindlessness as item transitions toemento; replacement/duplication purchases	Pleasure (looking good in it) Product degradation via satisfying but frequent use; replacement purchases/disposal after short period
Design approach	Perceived irreplaceability is stimulated via design for continual engagement and re-engagement; commands emotional investment and mindfulness	Perceived irreplaceability is function of holistic and fluid product lifecycle design, anticipating post-consumption phase; item disposal and/or accessible replacement without environmental harm
Design ingredients	'a whole grain or fresh vegetable' Functional quality and emotional triggers of equal importance Design for pleasure elicitation and engagement: Surprise Modularity Product-service design concepts facilitate reinvention (update, upgrade, transform) Age with dignity	'glucose ingested to do something physical' Cradle-to-cradle approach to nutrient generation designed to continuously fold back into industrial system: Technological metabolism presumes recyclability or re-use: Examine recyclability of material choices

*(Continued)*

**Table 3.** (Continued)

<i>Design recipe</i>	<i>High dietary quality</i>	<i>Have your cake and eat it, too</i>
Design for personality congruence:		Ease of disassembly
Personalization		Biological metabolism presumes compostability:
Mass customization		Composted in back yard or industrial setting
Do-it-yourself		Emphasis on cellulosic fibers
Half-way		Ideal wearing times proposed by designer, anticipated accurately
Moderate to high level of quality materials required for use intensity		Producers inform consumer of optimal use time
Creation of new, different, layered meanings with iteration		Stable product assortment for ease of replacement; same item, different colours or patterns
		Product-service rental or swapping concepts offer emotional satisfaction of newness with benign impacts
New clothing metabolism	Slow metabolism	Fast metabolism
	Higher-quality choices provides stable energy flow for engaged use over time	Quality appropriate to energy needs provides better-paced, less-erratic energy spike for active use
	Consumer is active, devoting time, attention, and care to the consumption process	Consumer experiences pleasure and satisfaction in active use, but escapes hangover when product degrades
	Prevention of superfluous purchases that only yield a short-term high	Accommodation of short-term high for active use with anticipated end-of-life strategy

<sup>1</sup>Clothing carbohydrate binge: emotional peaks and valleys associated with fast fashion consumption.



ownership and frequent use (Jeans or Casual Bottoms and Active-wear), where disposal and replacement is anticipated. Emotional attachment happens to be active in both cases, but with different implications for the wardrobe metabolism, slow and fast. Both scenarios evidence likelihood for an emotional deficit either by product disengagement when items transition to a memento, or by disposal and replacement after satisfying but frequent use.

When designing for emotional attachment, perceived irreplaceability is the end game (Kleine, and Baker, 2004), arguably essential to sustainable clothing consumption, requiring a more emotional and mindful experience. Being more emotionally connected and mindful about a clothing item commands attention that may ensure a more stable engagement level over time. This mindfulness is akin to a more aware and informed consumer who may utilize nutritious carbohydrate choices for the useful energy it embodies rather than binging on low-quality refined sugars and grains that yield more cravings.

The following discussion is organized around two sustainable design recipes that exhibit qualities prompting perceived irreplaceability as design inspiration but utilize different ingredients to counter the inherent peaks and valleys associated with fast fashion consumption (e.g. a carbohydrate binge). Table 3 illustrates the conceptual process that the metabolic analogy provides for sustainable design.

### ***Sustainable design recipe: perceived irreplaceability via high dietary quality***

One alternative to the carbohydrate binge is to simply make better and more-informed food choices and moderate intake to meet but not exceed energy or caloric needs. This approach provides stability while also providing the fuel that is actually needed to function at an effective level. To do this, a consumer must be active, devoting time, attention, and care to the consumption process. A comparison may be made between this approach to diet and design approaches that drive perceived irreplaceability, which command both emotion and mindfulness.

Let us first discuss the case of T-shirts or Sweatshirts. Although many of these items experienced a long ownership period, a large number had been relegated to rare use or storage. Emotional values (memories) accounted for most of the justifications for attachment. A football jersey may only be dusted off for the home game that then becomes the keeper of an autobiography (Kleine, 2000). Likewise, Dress Clothing experiences a lengthy ownership, but over half were seldom used. Unlike T-shirts and Sweatshirts, Dress Clothing was associated with a broad mix of attachment determinants such as functionality (31%; comfort, fit), emotional values (21%; memories), pleasure (17%; looking good), and style (14%; classic, unique). Quality and fit made them feel and look great, but some of these

items also became mementos. This may indicate interaction with a number of determinants, as dimensions like functionality and aesthetic quality often fuel pleasure and enjoyment (Mano and Oliver, 1993). Some participants' attachment seemed to be derived from a public origin (approval of others), while others emphasized the private origins (internal gratification) (Kleine and Baker, 2004).

From an environmental perspective, the long ownership time of these products is attractive. Yet, if frequency of use is the gateway to a more enduring emotional relationship between consumer and product (Ball and Tasaki, 1992), the potential lack of engagement here raises a number of questions. Will we consider product longevity sustainable even if consumer-product engagement is fickle? Is the storage of an ever-increasing number of goods sustainable? More importantly, to what extent does the retention of clothing for decades prevent the consumer from purchasing new items, diminishing perceived irreplaceability for the older one? These issues beg for further empirical inquiry, but let us ponder some potential solutions.

Creating opportunities for consumers to continue engaging or to re-engage with garments over time is an important design consideration, creating a metabolism where the item circles back through the consumer's life, creating new, different and layered meanings with each iteration. This is akin to foregoing a confection over a whole grain or fresh vegetable to permit a more stable energy flow over time. Designing for continued engagement may positively influence perceived irreplaceability, preventing superfluous purchases that only yield a short-term high. Both functional aspects of the design as well as emotional triggers will be equally important. Some authors recommend designing products that continue to incorporate pleasure-eliciting attributes, such as products that surprise (Mugge *et al*, 2008); for example, suiting that is updateable or upgradeable. Likewise, modular design may offer a more active role for the consumer in changing the appearance of some elements of the garment, providing re-engagement prompts when the passion associated with the initial design nonetheless fades.

The need for product-service design cannot be underestimated. Providing services to help consumers reinvent what may otherwise gather dust could be especially useful for both T-shirts and Dress Clothing. Services that offer ways to pull out the old football jersey and reinvent it into a new and different object provide a creative outlet to re-engage, providing a sense of newness while also keeping the memory current. Providing services to update, upgrade, and transform work wear may also be valuable to the consumer, especially because this product category's moderate to high level of quality makes redesign more possible.

Designing products that age with dignity may also offer surprise that is endearing to the consumer (Mugge *et al*, 2008). Previous research shows that consumers consider the ageing process of real leather to

be aesthetical (Niinimäki, 2010). Likewise, products designed to be especially congruent with a consumer's personality may spark continued engagement (Govers and Mugge, 2004; Mugge *et al*, 2006; Richins, 1994). Personalization may be facilitated through mass customization or more interactive strategies such as do-it-yourself (DIY) or half-way products. The perceived control or mastery of the product through these mechanisms requires the investment of psychic energy, fostering a deeper bond (Ball and Tasaki, 1992; Belk, 1987). Whatever the choices are to be, sustainable design for product types intended to be symbols of self-expression or memory-keepers require the designer to think far beyond the initial design to the entire product lifespan.

### ***Sustainable design recipe: perceived irreplaceability via having your cake and eating it, too***

It is difficult to imagine relegating to the past the joy of indulging in some sugary treat, just as one may revel in the pleasure of a new pair of jeans. The entrance of such input into the body prompts the generation of insulin, which facilitates the use of the glucose ingested to do something physical. However, when this input of resources is not utilized quickly and efficiently, insulin may be stored in the body, leading to low energy and weight gain (Jenkins *et al*, 1982). Similarly, there are cases in this study where the experience with a clothing item owned only for a short time is so satisfying that emotional attachment occurs, even when the hangover of disposal and replacement admittedly looms. For example, Jeans and Activewear both experience only moderate owning times and frequent use, attachment to both categories being chiefly influenced by functionality and the pleasure derived from looking good in it. Notably, the instrumental value of these items, the ability for the product to help the user *do* (like a glucose source) is high, while the symbolic value is not as important (Csikszentmihalyi and Rochberg-Halton, 1981).

It is easy to surmise that the frequent use of these items will lead to degradation and then disposal, for which functionality aspects are important design considerations. Logic suggests that comfort, good fit, and utility through the use of higher-quality materials may very well guide sustainable design for attachment. Fletcher (2012) recently argued, however, that in reality, durability as design strategy might be too simplistic. A more critical exploration for the designer may permit the pleasure and emotional satisfaction of actively using a seemingly irreplaceable piece of clothing with some assurance that the item can be disposed of without environmental harm. This design recipe for a more emotional and mindful relationship is akin to having your cake and eating it, too. In fact, by anticipating the post-consumption phase, the designer offers the consumer something to look forward to besides the emotional regret of detachment and disposal.

Cradle-to-cradle principles may offer suitable guidelines for designers. Originally launched by Walter Stahel in the 1970s and

again at the beginning of the new millennium by McDonough and Braungart (2002), these principles proscribe design and manufacturing for multiple life product or materials cycles. After the first life, a product can be a fuel to two different cycles: technological (cycled to create a new material), or biological (composted). Doordan (2013) argues that designed products should be treated as 'nutrients of an industrial metabolism' and the end of one life leads to another. For product types that are not intended to be symbols of self-expression or memory-keepers but rather a channel for lived experience, product satisfaction is fundamental both during use and beyond, both cycles (technological or biological) being suitable for clothing. When a piece of clothing loses its functionality, material choices that allow an item to be composted or re-used by way of disassembly or recycling may provide viable solutions. For example, current research developments are underway to identify these types of possibilities for cellulose fibres that may be safely composted (biological nutrient), or clothing that may be recycled without a loss of quality (technological nutrients). Here, ideal wearing time is anticipated accurately and producers can even inform the optimal use time when it is expected back for composting or recycling. Again, product-service models may be useful to rent rather than sell products used for a short time and returned to the manufacturer for a second life, biological or technical. The designer becomes a 'nutrient manager' (Daniels and Hamman, 2009, p. 13). Products become a part of a larger system of material and energy flows, very similar to the facilitation of carbohydrates and subsequent energy flows in the metabolism.

A more stable product assortment that allows consumers to trust that similar items will be available during the replacement phase, perhaps in different colours or patterns, sends the message to the consumer: 'It is okay to help yourself to seconds.' A fast metabolism, currently associated with hangover, becomes better-paced and less erratic when the same or similar designs can be ordered years after. Further, product-service designs like rental or clothing swaps offer emotional satisfaction, like a sugar carbohydrate treat, in a more environmentally friendly way than purchasing new garments. This permits the consumer to experience the 'high' of newness without the environmental and social consequences. Perceived irreplaceability then becomes a function of a more holistic and fluid product lifecycle, rather than a long relationship steeped in history.

## Conclusion

Like an injection of excess carbohydrates into the human metabolism, the infusion of the concept of fashion into today's wardrobe metabolism creates a short-term high that results in much waste as well as emotional consequences. A new design paradigm is needed; a new metabolic rhythm for the life of clothing characterized by fewer superficial highs and lows. Designing for increased emotional quality

and mindfulness is the persistent challenge for clothing designers now and in coming decades. Designers may develop healthier design recipes that better pace the wardrobe metabolism by being responsive to the different contexts where emotional attachment is fostered.

This study proposes some design recipes that could counter the seeming carbohydrate binge in the fast fashion cycle, by narrowing the designer's scope to solutions that are responsive to types of sustainability challenges embodied by specific types of clothing. This study punctuates the critical importance of context when designing for emotional attachment, and the real end game: perceived irreplaceability. The authors demonstrate that sustainable design does not necessarily mean a slow metabolism, but the accommodation by the designer for both slow and fast metabolisms.

### **Limitations**

The sample utilized for this research is largely the product experience of educated Caucasians from the USA. The product categories most cited by participants to which they were most attached may be different had the data been gathered in an alternative culture. Items like T-shirts and jeans as well as dress clothing worn to work may be argued as quintessential garments of American culture. It is worth noting, however, that the current study's findings regarding the determinants of emotional attachment were consistent with findings from the previous study, regardless of the fact that the previous sample was predominantly young women in Finland and the current sample were both men and women from the USA across a broad age range. We can assume that the design recipes developed from these data would unlikely be very different if conducted in another Western culture, with the exception of nuances that may be seen in product categories.

### **Disclosure statement**

No potential conflict of interest was reported by the authors.

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