Article

Examining Sustainable Consumption Behaviors Through the Mass Customization Context: Emotional Product Attachment and Environmental Attitude Perspectives

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ABSTRACT

Background: Existing research regarding mass customization apparel (MCA) has suggested that the business model can be sustainable from a production perspective; however, minimal research has been conducted to understand MCA from the consumer perspective and how it relates to sustainability. The purpose of the study was to explore the linkage between mass customization apparel consumption and sustainability. Specifically, this study examined the relationships among motivations for MCA purchases (MMP), clothing sustainability knowledge (CSK), emotional product attachment (EPA), environmental attitude (EA), sustainable apparel behaviors (SAB), and general sustainable behavior (GSB).

Methods: A total of 220 responses were collected from existing MCA consumers via an online survey distributed through Amazon Mechanical Turk (MTurk). Modified from existing literature, all major variables in the study were measured on 7-point Likert type scales.

Results: Regression analyses indicated that all relationships of the study were significant except for the relationship between utilitarian motivation for MCA purchases and emotional product attachment and the relationship between self-expressive motivation for MCA purchases and environmental attitudes. Direct relationships between MMP and SAB/GSB, and between CSK and SAB/GSB were examined as well. CSK was found to be the strongest predictor highlighting the importance of educating consumers about clothing sustainability to promote responsible consumption behaviors.

Conclusions: This study found evidence of the relationships between motivations for MCA purchases and sustainability-related variables. Future research can further examine how MCA consumers vs. non-MCA consumers might differ in their sustainable behaviors.

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KEYWORDS: responsible production and consumption; clothing sustainability knowledge; environmental attitudes; mass customization apparel; sustainable behavior; product attachment

INTRODUCTION

Customization requires personalization and is made-to-order to some extent. Davis [1] conceptualized mass-customization (MC) as the production of customized goods on a mass basis that are priced comparably to mass-produced goods. MC products benefit retailers for the ability to eliminate markdowns and inventory [2]. MC also benefits consumers by providing a unique product that better meets individual needs [3]. Today MC is seen across product and service industries from made-to-order cars and computers to customized internet, cable, cell-phone service plans, and customized clothing.

In the context of clothing, made-to-measure and custom-made apparel are the historic roots of clothing, prior to the industrial revolution and the rise of ready-made apparel and mass- production [4]. Over the past two decades, innovations in apparel production technologies have renewed interest in customization (e.g., [5,6]); today, production of mass customization apparel (MCA) products can be seen in daily-wear categories like jeans, t-shirts, blouses, skirts, and trousers. For instance, womenswear brands like eShakti and Sumisurra offer business and casual attire that can be customized to the consumer's style and fit preferences [7]. Another online MCA brand, Frilly, promoted sustainability (i.e., reduction of waste) as a key reason for choosing the MCA production model [8].

Research has suggested that transitioning apparel production back towards the custom paradigm seems to afford the potential to improve retailers' sustainability in all three areas: financial, social, and ecological [9]. Particularly, MCA production is believed to offer ecological benefits compared to traditional mass-production by reducing the scale of production and eliminating deadstock [6,10]. However, extant MCA literature has examined sustainability primarily from a production perspective [11], with very little attention given to the consumption side of sustainability. Among the few studies that have discussed MCA and sustainability, researchers have connected emotional product attachment to product longevity (e.g., [12,13]). Unfortunately, there is no existing information relating MCA purchases to sustainability variables or sustainable consumer behaviors. Due to the limiting nature of the mostly student samples studied in previous MC and MCA research, it is unknown whether and to what extent MCA consumers may display sustainable behaviors or characteristics. In order to achieve long-term sustainability

in the apparel industry, the consumer perspective must also be addressed [14] in the MCA context.

Previous MCA consumer-related studies have used stimuli such as jeans [15], t-shirts [16–18], scarves [16,18,19], and leisure clothing [20] to investigate consumer motivations, perceptions, and purchase intentions toward MCA products. Unfortunately, minimal research has examined whether and how consumers' knowledge about sustainability impacts of clothing might be associated with MCA purchases even though sustainability knowledge about clothing impacts has been found to impact consumers' purchase intentions toward sustainable clothing in general [21]. Furthermore, individual characteristics such as one's environmental attitude has been found to influence consumer behavioral intention toward sustainability (e.g., [21]); however, the variable has not been widely examined in the context of apparel mass customization.

Purpose of the Study

Extant literature has suggested MCA affords sustainability benefits from the production or business perspective (e.g., [6,10,22]). However, to date, no research has examined mass customization and sustainability from the consumer perspective. Thus, the purpose of the study was to explore whether a linkage between mass customization apparel and sustainability existed and whether and how the linkage might be reflected through consumers' general and apparel specific sustainable behaviors. According to the value-attitude-behavior hierarchy [23], values influence attitudes, which result in the behaviors of the individuals through the hierarchical procedure. Homer and Kahle [23] insisted that "within a given situation, the influence should theoretically flow from abstract values to midrange attitudes to specific behavior" (p. 638). This study used the value-attitude-behavior hierarchy [23] to examine if motivations for MCA purchases (MMP) and clothing sustainability knowledge (CSK) influenced emotional product attachment (EPA) and environmental attitude (EA), and whether these attitudes, in turn, would predict sustainable apparel behaviors (SAB) and general sustainable behavior (GSB).

Specifically, personal values have been studied extensively as a way to understand consumers' decision-making processes and to predict the effects on consumption and purchase intentions [23–25]. Values are defined as "abstract beliefs about behaviors or end-states of existence that transcend specific situations and guide the selection or evaluation of behavior and events" [26] (p. 551). Of interest for the present research, consumer motivations for MCA purchases included both hedonic and utilitarian values that would help explain reasons for consumers' purchases. Within a mass customization context, these hedonic and

utilitarian motivations can be reflected in both the purchased product and the experience of customizing on the online platform. Additionally, consumer knowledge related to apparel sustainability (i.e., clothing sustainability knowledge) were consumer beliefs that have been found to influence attitudes towards sustainable fashion and related purchase intention [21].

Cognitive beliefs are likely to influence attitudes [27]. Deemed as overall affective states, emotional product attachment and environmental attitudes were included in the present research to represent attitudes in the hierarchy, which lead individuals to behave in a certain way [28]. Sustainable consumption behavior, both apparel specific and general were incorporated to represent the behavior component in the hierarchy.

In particular, sustainable apparel consumer behaviors captured a range of clothing specific behaviors, including pre-purchase information gathering (i.e., checking care labels), consumption and maintenance behaviors (e.g., laundry or repair), and disposal behaviors. Meanwhile, general sustainable behaviors were included in the current study to gauge consumers' general willingness to participate in sustainable behaviors such as conserving household energy and recycling. Examining the two types of behaviors separately would enable a more nuanced perspective on current consumer behaviors and may provide managerial implications. Additionally, the inclusion of sustainable apparel behaviors (SAB) and general sustainable behaviors (GSB) as separate variables was further considered necessary given that general sustainable behaviors, such as recycling and energy conservation, are more widely considered and practiced; whereas sustainable behaviors related to apparel consumption are still relatively new in consumer practice and may be unfamiliar to MCA consumers [29].

Conceptual Framework

Following the value-attitude-behavior hierarchy, a conceptual framework was developed for the current study (see Figure 1) to guide the development of the research questions associated with the proposed relationships among three major groups of variables: (1) values, represented by consumers' motivations for MCA purchases and clothing sustainability knowledge; (2) attitudes, denoted by emotional product attachment and environmental attitude; and (3) behaviors, characterized by sustainable apparel behaviors and general sustainable behaviors.

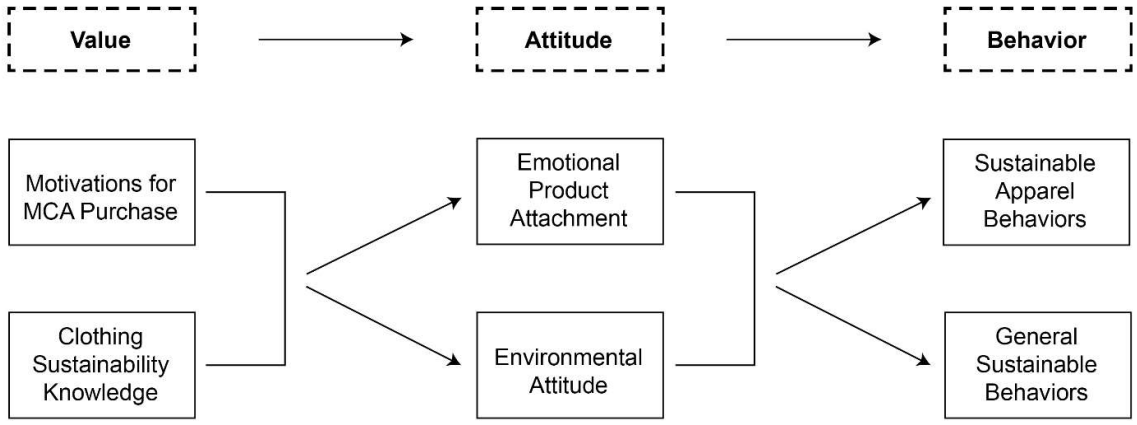

Figure 1. Conceptual framework model.

Exploratory in nature, this study was specifically guided by the following research questions:

RQ #1: To what extent do consumers' (a) motivations for MCA purchases (MMP) and (b) clothing sustainability knowledge (CSK) influence their emotional product attachment (EPA) to MCA products?

RQ #2: To what extent do consumers' (a) motivations for MCA purchases (MMP) and (b) clothing sustainability knowledge (CSK) influence their environmental attitudes (EA)?

RQ #3: To what extent do consumers' (a) emotional product attachment (EPA) to MCA products and (b) environmental attitudes (EA) influence their sustainable apparel behaviors (SAB)?

RQ #4: To what extent do consumers' (a) emotional product attachment (EPA) to MCA products and (b) environmental attitudes (EA) influence their general sustainable behaviors (GSB)?

Mass Customization Apparel (MCA) and Sustainability

Limited empirical research has examined MC from an ecological sustainability perspective; the few studies that have promoted the topic have approached it from the production perspective [22,30], however empirical evidence suggests that consumers who design their own customized apparel products intend to keep them longer than apparel that is bought off the rack [31]. It has been put forth that mass customized production could "sharply reduce overall production, waste creation, and resource consumption" [32] (p. 95) in the apparel sector by decreasing overproduction and the associated environmental impact required by the production of deadstock [10]. Previous research has suggested that a MC business model would provide lower inventories, better employee relationships, and a "sense of community" compared to the current mass

production (MP) model which relies on high inventories, a "lack of investment in worker skills" and "poor management—employee relations" [6] (p.165). Current research suggests a hybrid model that adds MC production to an existing MP business has the potential to reduce environmental impact for apparel firms in certain conditions [22]. The advantages of the MCA business model offer potential ecological and social benefits. Nayak et al. [6] suggested that body measurement technologies such as 3D body scanning, which allows clothing brands to develop clothes that better fit individual bodies, have the potential to reduce the number of clothing returns when applied to mass customization. Decreased returns of clothing would not only benefit MCA retailers financially but also reduce the possibility for excessive, unused clothing to go to landfills [33]. Furthermore, it has been suggested that customization could lead to prolonged product lifespan due to the development of the bond between the consumer and the clothing (i.e., emotional product attachment) through the self-expressive nature of the product afforded by the interactive process of mass customization [34]. While the overlap between the MC business model and sustainable practices has been discussed, there is a gap in the literature regarding empirical evidence within the apparel context, especially with consideration of the consumer.

Motivations for MCA Purchases

Motivations are reasons for individuals to behave in a certain way to fulfil their needs and desires [35]. In an online shopping experience, retailers can capitalize on both hedonic and utilitarian dimensions afforded by the virtual shopping environment, which have been seen to influence the quality perception among online apparel consumers [36]. Extant literature has suggested more interactive websites can enhance consumer happiness through the hedonic dimension [37]. In the online MCA context, the interactive product customization process allows consumers to create a product better suited to their functional (e.g., fit) and/or hedonic (e.g., uniqueness, self-expression) needs. By meeting consumers' utilitarian and hedonic needs, MCA brands can differentiate themselves from traditional online apparel retailers and may benefit from repeated MCA purchases and/or brand loyalty [36]. Research has suggested that MCA consumers are motivated to engage with MCA purchases for these product (e.g., a unique or functional product) and process benefits—that is, the hedonic pleasure of creating your own apparel [38]. Both functional and hedonic benefits of the MCA business model are made possible by the interactive design process that is inherent and unique to the online customization experience.

Previous MCA research identified the uniqueness of the product and exciting 'co-design'-like experience as influential in students' willingness to participate in online apparel customization [39]. Online customization requires the consumer to select from various modification options as predetermined by the manufacturer [40]. The interactive process results in feelings of creative achievement [16,38,41] and pride in oneself [18] as consumers help to design their own product. Hedonic value [2,42] and process enjoyment [19] associated with MCA were shown to have a positive influence on purchase intentions and product evaluations in enjoyable customization experiences [16]. While the interactive design process may motivate the initiation of a MCA purchase decision, the user-experience with the online customization platform (e.g., ease of use) may influence consumers' repeated purchase decisions and overall satisfaction with MCA [41].

Clothing Sustainability Knowledge

Sustainable clothing practices involve a decision-making process which starts with the purchase phase of sustainable clothing. Following the study by Yan, Diddi, and Bloodhart [43], consumers' clothing sustainability knowledge (CSK) refers to individuals' understanding of social- and environmental-related impacts of clothing in the current study. Researchers have suggested that consumers generally have a low level of knowledge regarding sustainability issues in the fashion industry because of the complex, global nature of apparel supply chains encompassing numerous steps through sourcing, manufacturing, transportation, distribution, consumption, and disposal [44,45] and the scarcity of information that is available to consumers [46]. Recent trends focusing on the traceability of apparel supply chains [47] and increasing numbers of news stories and documentaries have helped increase consumer knowledge regarding environmental and social impacts of the clothing industry and what companies have done to mitigate those impacts [21]. Nonetheless, research has suggested that the majority of consumers do not consider sustainability in their clothing decision-making processes for various reasons. First, discussions about environmental impacts of clothing often involve technical jargon which are not always easily understood by average consumers [43] and may, in fact, lead to dilemmas that impair the decision-making process [48]. Second, even though clothing is characterized as a second skin, most consumers do not perceive clothing in the same way that they perceive food from a health perspective [49] and thus pay less attention to the health implications of clothing. Third, research has shown that consumers would rather enjoy their clothes shopping trips and purposefully choose to distance themselves

from thinking about sustainability of clothing in their decision-making processes even though they are aware of the potential impacts of their clothing consumption choices [29].

Hiller Connell [45] recognized knowledge about sustainable apparel purchases to be one of the two personal barriers for sustainable clothing practices, in addition to attitudes toward sustainable apparel products, and suggested that apparel and textiles educators incorporate sustainability into their curricular. Hiller Connell and Kozar [50] found that undergraduates' knowledge of social (e.g., use of child labor and the treatment of workers) and environmental (e.g., chemical pollutants produced in the manufacture and processing of fibers and the recycling and biodegradability of apparel goods) issues related to the apparel industry increased after enrolling in a course on globalization and sustainability issues in the apparel industry. Similarly, Preuit and Yan [21] further suggested that short educational modules demonstrating the negative sustainability impacts of fast fashion and positive sustainability impacts of slow fashion improved participants' knowledge towards slow fashion (vs fast fashion) and attitudes toward slow fashion. Although previous studies did not see significant behavioral changes regarding sustainable apparel purchases among participants [21,50], the change towards a more sustainable apparel purchase behavior was witnessed regardless.

In the context of MCA, it is believed that sustainability impacts of consumers' decisions can be communicated during the interactive design process through the MCA sales platform where the seller (e.g., MCA retailer) can communicate to the buyer (e.g., the customer) about details related to environmentally responsible products [51]. While marketing MCA products by emphasizing the hedonic benefits of the customization process, MCA retailers could also communicate production details (e.g., the origin of materials or production volume) and product value (e.g., better fit) to help enhance consumers' understanding of MCA and promote stronger connections between the customized products and the wearers.

Emotional Product Attachment

Emotional product attachment, which has also been referred to as psychological ownership [52], is defined here as the connection between an individual and an object [3]. Research has shown that product attachment may be positively influenced by product utility [53] and psychological ownership could increase a product's price evaluation [16]. Previously, a direct positive correlation was shown between the amount of effort involved in personalizing a bicycle and the emotional bond created [54], suggesting that the interactive design process and creative-

achievement benefits of MCA purchases could lead to increased emotional product attachment. Additionally, products perceived as more valuable may also be view as less disposable by consumers [13], implying a possible connection to more sustainable consumer behaviors, such as extended product longevity and reduced consumption, through emotional product attachment.

MCA product benefits like self-representation and a unique product may also be linked to higher levels of emotional product attachment and increased product longevity [13,52] due to viewing the product as an extension of oneself [34]. Although previous research has not empirically validated the "commonly held assumption that product attachment can have a positive effect on consumption patterns" [11] (p. 660), extant literature has suggested positive associations between high emotional product attachment and reduced consumption of apparel (frequency and quantity) [12] and longer product and retailer relationships [3]. Further, personalization has been highlighted as a strategy for designers to embrace for increasing product care and therefore product longevity [55].

Environmental attitudes

An individual's environmental attitudes (EA) are characterized by environmental concerns and whether they view environmental degradation as a product of human activity [56]. EA is regarded as two-dimensional—attitudes pertaining to the degradation of the environment are reflective of the perceived individual and societal roles [57]. In an apparel context, extant literature suggests that positive environmental attitudes related to lower materialistic values [58,59] and increased participation in sustainable fashion consumption [60].

Existing literature has found that sustainable product purchase intentions are influenced by positive environmental attitudes. Pro-environmental attitudes showed a significant positive effect on sustainable apparel and textile purchase intentions [61], while pro-ecological and pro-social attitudes more specifically predicted purchase intentions toward sustainable apparel products [62]. In a more recent study, inward environmental attitudes were found to positively influence purchase intentions for eco-friendly products generally [57]. Although research has suggested the relationships between environmental attitudes and patronage behaviors with sustainable products, it is unclear how environmental attitudes may relate to MCA purchase behaviors. It is assumed that environmental attitudes could also predict sustainable apparel related behaviors among MCA consumers due to the potential sustainable nature of MCA products.

Sustainable apparel behaviors

Sustainable apparel behaviors are activities that minimize environmental and social impacts and include limiting purchases; extending the life of garments through repairs and alterations; reducing energy consumption while laundering (e.g., lower water temperatures, hanging clothes to dry); and donating, upcycling, or recycling garments [14,29]. Sustainable fashion consumption [60], environmentally friendly apparel consumption [63], environmental apparel purchases and sustainable apparel divestment [12] have been addressed in the literature for the purpose of identifying consumer characteristics that may influence sustainable consumption behaviors. For example, Cho et al. [12] conceptualized the term 'style consumption' as a way to promote more sustainable consumption of apparel, whereby consumers make purchase decisions based individual style that is "classic and at the same time speaks about oneself" (p. 662). Style consumption was positively related to environmental apparel purchase and sustainable apparel divestment, and is believed to promote product longevity and durability [12]. More recent research identified personal norms, guilt, and intention as key predictors for sustainable consumption behaviors of fashion products [48].

The full product lifespan must be considered when determining an individual garment's environmental impact, therefore consumer behaviors play a significant role in clothing sustainability. Previous research identified product quality and trendiness as predictors of consumer disposal behaviors [64]; low-quality clothes that are no longer in fashion are more likely to be discarded than high-quality, timeless garments. Further, consumers that purchase high volumes of clothing frequently, even if they are sustainably produced, are not practicing sustainable apparel behaviors, but rather overconsumption [62] resulting in more waste and a larger environmental impact than low frequency and volume consumers [65]. In contrast, extending the usable life of a garment by nine-months reduces the environmental impact of production 20–30% [66]; consumers who are able to extend the life of their apparel products are likely engaged in other sustainable behaviors such as mending and repairing, and less frequent purchases, further aligning with sustainable behaviors generally. Considering the sustainable characteristics of MCA production, this research attempted to expand the understanding of MCA sustainability from the consumer perspective by examining whether there are significant relationships between consumers' MCA motivations and their sustainable apparel behaviors.

General sustainable behaviors

In addition to apparel specific sustainable consumer behaviors, general sustainable consumer behaviors were also examined in the current study to provide additional insight into the sustainability mindset of MCA consumers. General sustainable behaviors include behaviors such as recycling, commuting via public transit, conserving household energy or water use (e.g., turning off lights when not in rooms, taking shorter showers), and choosing to purchase environmentally friendly consumer goods [67]. Previous research has examined the causes or motivators of green purchase behavior [57], many in the context of how environmental knowledge and attitudes would lead to sustainable purchase behaviors or intentions (e.g., [68,69]); however, other types of sustainable consumer behaviors have not been examined extensively. Hansen and Yan [70] suggested that individuals with subjective knowledge about recycling were more likely to have higher levels of recycling intentions. Domina and Koch [71] examined the recycling habits of apparel consumers and found that access to, convenience of, and education about recycling influences more recycling behaviors, including materials such as textiles and apparel. By considering MCA consumers' general sustainable behaviors in addition to their apparel-specific sustainable behaviors this research provided a holistic understanding of sustainable consumer behaviors. Taken together with the exploration of factors like clothing sustainability knowledge and individual motivations for purchasing MCA, this research aimed to provide theoretical and managerial implications for academics and professionals promoting sustainable lifestyles.

METHODS

An online survey was created using Qualtrics and distributed through Amazon Mechanical Turk (MTurk), resulting in a total of 496 responses. The data screening procedure included verifying inclusion criteria we met, these were: (1) 18 years or older, (2) reside within the United States, and (3) experience purchasing at least one MCA item in the two years prior to survey completion. As recommended by extant literature on using MTurk data collection methods, various additional quality checks were incorporated into the survey (e.g., [72,73]). These included an attention check, numerical responses requiring validation (i.e., year not entered as four-digits, or percentage not adding to 100), and open-entry questions to screen for invalid responses (e.g., false or non-relevant responses, bots). Data screening was conducted by the primary researcher and agreed upon by the secondary researcher; following the data screening procedure, 220 responses were included for final data analysis. The sample size was deemed appropriate following Green's [74] recommendation.

The self-reported survey took approximately 10 minutes to complete and consisted of sections related to respondents' previous MCA purchases as well as the six variables of interest. All major variables were modified and developed based on previous literature and assessed using multi-item scales drawn from or created based on the literature review and measured with 7-point Likert type scales using 1 = strongly disagree, 7 = strongly agree for value and attitude measures, and 1 = never, 7 = always for behavioral measures. Items for motivations for MCA purchases were adapted from Merle et al. [38]; items for clothing sustainability knowledge were modified from Preuit [21]; emotional product attachment items were adapted from Mugge et al. [54] and Park & Yoo [3]; environmental attitude items were from Trivedi et al. [57]; items for sustainable apparel behaviors were from or adapted from Cho et al. [12] and Razzaq et al. [60]; and general sustainable behaviors were measured with items modified from Cho et al. [12], Razzaq et al. [60], and Trivedi et al. [57] or created based on a review of the literature. Demographic information (i.e., age, education, gender, and income) was also collected.

A priori factor analysis was conducted for the multi-item scales of defined variables (i.e., motivations for MCA purchase, clothing sustainability knowledge, emotional product attachment, environmental attitude, sustainable apparel behaviors, and general sustainable behaviors). Principal component extraction was based on eigenvalues greater than one. Varimax rotation was applied to model solutions indicating more than one factor (i.e., motivations for MCA purchase, sustainable apparel behaviors) to define sub-factor groups. Factor loadings at or above 0.40 were accepted [75], and Cronbach's alpha was used to assess scale reliability; all analyzed variables had acceptable reliabilities above 0.60 [76]. See Table 1 for details about measurement items and related sources. Following factor analysis results, the conceptual model was revised to reflect the sub-factor groups identified, see Figure 2. Composite scores for each variable were calculated for further analysis. Six sets of multiple regression analysis were performed to address the research questions posed by the conceptual framework as informed by the revised sub-factor variable groups.

Table 1. Factor analysis and scale reliability for motivation variables.

Source	*Variable*	*Factor Loading*	*Var. Exp.*	*Rel.*
	Motivations for MCA Purchase (Two Factors)			
	Factor 1—Self-Expressive Motivations		45.71%	0.76
Adapted from [38]	With these customized apparel products, I will not look like everybody else.	0.83		
	With the customization website (or app), I could design apparel that others will not have.	0.71		
	With these customized apparel products, I have a small element of differentiation compared to others.	0.60		
	The customized apparel products convey exactly who I am.	0.62		
	The customization platform gave me a lot of freedom in the creation of the apparel products, and I really enjoyed it.	0.66		
	Factor 2—Utilitarian Motivations		14.60%	0.73
Adapted from [38]	Apparel customization has allowed me to create products that are most adapted to what I am looking for.	0.83		
	The customized apparel products I have purchased are products that I really wanted to have.	0.88		
	Clothing Sustainability Knowledge (One Factor)		62.21%	0.85
[21] (* adapted from)	I know about the environmental impacts of the clothing I purchase.	0.78		
	I know about the social impacts of the clothing I purchase *.	0.80		
	I know what the term "Fast Fashion" means.	0.78		
	I know about the impact of fast fashion products *.	0.86		
	I think customized apparel is a more sustainable alternative than apparel products commonly available on the market *.	0.73		
	Emotional Product Attachment (One Factor)		70.12%	0.89
Adapted from [54]	I have a bond with the customized apparel I have purchased.	0.81		
	The customized apparel products I have purchased are very dear to me.	0.88		
	I am very attached to the customized apparel I have purchased.	0.89		
	I will keep my customized apparel products longer than apparel that was already made when I bought it.	0.74		
Adapted from [3]	I feel connected to the customized apparel products I have purchased.	0.86		
	Environmental Attitudes (One Factor)		70.55%	0.90
[57]	I am very concerned about the environment.	0.82		
	I would be willing to reduce my consumption to help protect the environment.	0.82		
	Major political change is necessary to protect the natural environment.	0.86		
	Major social changes are necessary to protect the natural environment.	0.88		
	Humans are severely abusing the environment.	0.81		
	Sustainable Apparel Behaviors (Three Factors)			
	Factor 1—Pre-Purchase Behaviors		40.97%	0.86
[12] (* adapted from)	I buy clothing that is made with recycled content.	0.72		
	I buy clothing that is made of organically grown natural fibers.	0.75		
	I purposely select fabrics that require cooler washing temperature *.	0.77		
	I purposely select fabrics that require shorter drying time *.	0.81		
	I purposely select fabrics that require less ironing *.	0.65		
[60]	I buy clothing which is produced in an environmentally friendly manner.	0.74		
	Factor 2—Longevity Behaviors		12.47%	0.72
[12]	I reuse clothing products for other purposes to get the most out of them.	0.70		
Adapted from [60]	I wear second-hand or used clothing.	0.80		
	I have my clothes repaired or mended to help them last longer.	0.70		
	Factor 3—Mindful Consumption Behaviors		8.64%	0.61
Adapted from [12] & [60]	I dispose of clothing in an environmentally friendly manner.	0.71		
	I donate my clothes when I no longer use them.	0.66		
	I buy higher quality, more durable clothes.	0.67		
	General Sustainable Behaviors (One Factor)		51.26%	0.83
Adapted from [57]	I buy environmentally friendly products.	0.80		
	I buy organic food.	0.70		
	I use products made from recycled materials.	0.76		
	I recycle household waste.	0.66		
Created based on literature review	I commute via public transportation, carpool, or bicycle.	0.56		
	I conserve household energy use (e.g., electricity).	0.66		
Adapted from [60]	I avoid purchasing products that are harmful to the environment.	0.82		

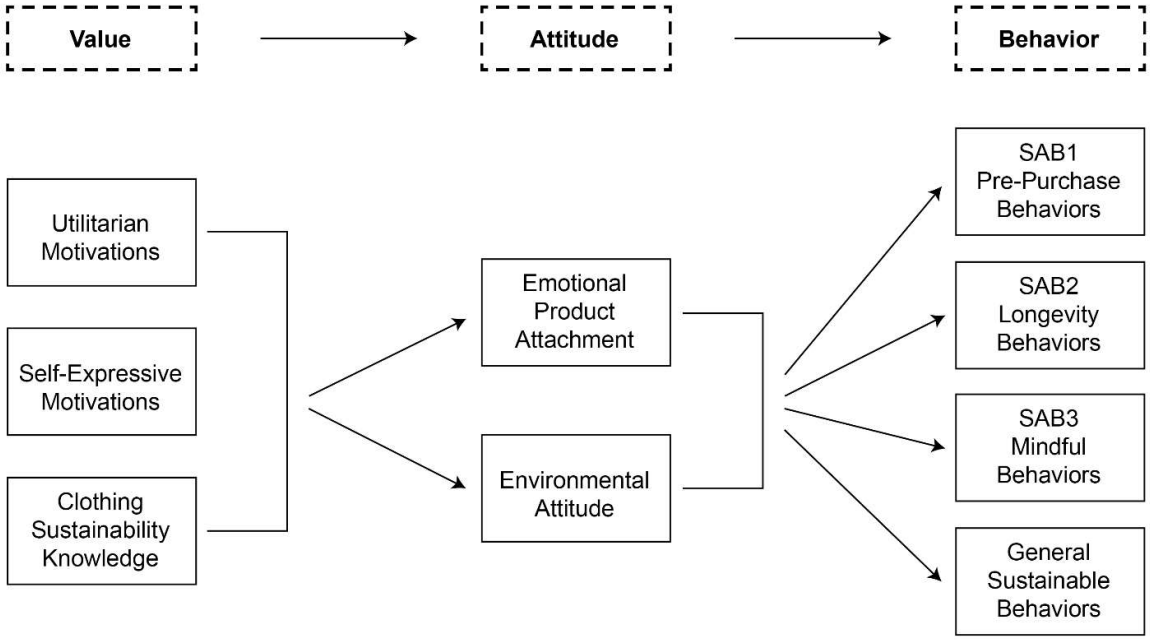

Figure 2. Revised conceptual model.

RESULTS

A total of 220 participant responses were included in the final analysis. The average age was 33.83 years old (median 32), with a range of 20–80 years of age (see Table 2). Specifically, genders in the sample were represented equally, with 50.0% female participants (n = 110) and two participants identifying as non-binary. Approximately 43% of participants held a Bachelor's degree, and approximately 45% of participants reported an income between $20,000 and $59,999. The sample population was representative of the U.S. population in regard to gender distributions but differed in that the median age was younger (sample pop. = 32; U.S. pop. = 38.3); the sample overrepresented Bachelor's degrees (sample pop. = 40.2; U.S. pop. = 20.2%) and underrepresented High School/GED diplomas (sample pop. = 12.3%; U.S. pop. = 27.0%); the income of the sample population overrepresented individuals making less than $20,000 annually (sample pop. = 16.8%; U.S. pop. = 6.8%) and underrepresented individuals making more than $100,000 annually (sample pop. = 6.8%; U.S. pop. = 16.3%) [77].

On average, participants spent $424 on approximately 10 apparel items over a six-month period. These figures were roughly aligned with U.S. Consumer Expenditure reports that individuals spent approximately $753 on apparel in the year of 2019 ($1883 spent per consumer unit of 2.5 persons) [78], and a large-scale empirical sampling European and United States consumers which found consumers bought roughly 6 apparel items

over a three-month period [63]. Relating specifically to MCA purchases, participants purchased MCA an average of 4.54 times over the two years prior to survey completion, purchasing an average of 5.89 items. The average duration of participants' MCA purchase behaviors was just under 4 years (M = 3.98), and the average percentage of MCA in participants' wardrobes was 15.91%. To the authors' knowledge, this was the first empirical study to collect data pertaining to MCA purchase behaviors among U.S. consumers.

Table 2. Participant demographics (*N* = 220).

Characteristics	(*n*)	%
Age		
Mean	33.83	
Range	20–80	
Education		
High School/GED	27	*12.3*
Some College	40	*18.2*
Associate's	38	*17.3*
Bachelor's	94	*42.7*
Master's	18	*8.2*
Doctoral	2	*0.9*
Professional	1	*0.5*
Gender		
Female	110	*50.0*
Male	108	*49.1*
Other	2	*0.9*
Income		
Less than $20,000	37	*16.8*
$20,000–$39,999	52	*23.6*
$40,000–$59,999	48	*21.8*
$60,000–$79,999	41	*18.6*
$80,000–$99,999	27	*12.3*
$100,000–$149,999	11	*5.0*
$150,000–$199,999	4	*1.8*

Descriptive statistics (see Table 3) showed that participants had generally high utilitarian and self-expressive motivation for MCA purchase (M = 5.81 and M = 5.33, respectively) and higher levels of environmental attitude (M = 5.42), compared to their emotional product attachment (M = 5.12) and clothing sustainability knowledge (M = 4.22). Mean scores for the sustainable apparel behaviors varied for the three factors; pre-purchase behaviors had the lowest mean score (M = 4.00), longevity behavior the second lowest (M = 4.62), and mindful consumption behaviors the highest mean score of the three SAB factors (M = 5.15). The

mean score for general sustainable behaviors was 4.50. The variance inflation factor (VIF) for relevant regression models ranged between 1.32 and 1.63 and the tolerance values ranged between 0.61 and 0.76. Because no VIF value exceeded 10 and the tolerance values were greater than 0.10, it was concluded that multicollinearity did not exist [79].

Table 3. Means of major variables.

Variable of Interest	Mean	S.E. of Mean	Std. Deviation	Min.	Max.
Utilitarian Motivations	5.81	0.07	1.04	2.50	7.00
Self-Expression Motivations	5.33	0.07	1.02	2.20	7.00
Clothing Sustainability Knowledge	4.22	0.10	1.47	1.00	7.00
Emotional Product Attachment	5.12	0.08	1.23	1.20	7.00
Environmental Attitude	5.42	0.09	1.30	1.00	7.00
SAB1 Pre-Purchase Behaviors	4.00	0.09	1.33	1.00	6.50
SAB2 Longevity Behaviors	4.62	0.09	1.41	1.00	7.00
SAB3 Mindful Behaviors	5.15	0.08	1.18	1.00	7.00
General Sustainable Behaviors	4.50	0.08	1.17	1.00	6.57

Regression Analysis

To answer the research questions, a set of multiple regression analysis was conducted. The first regression model addressed RQ #1, emotional product attachment was entered as the dependent variable with the values (i.e., self-expressive motivations, utilitarian motivations, and clothing sustainability knowledge) entered as the independent variables. The overall model was significant (R^2 = 0.30, F = 30.72, p < 0.001) and results indicated self-expressive motivations and clothing sustainability knowledge positively influenced emotional product attachment (β = 0.43, t = 6.50, p < 0.001; β = 0.20, t = 3.41, p < 0.01, respectively). However, utilitarian motivations was not significant in the model (β = 0.11, p > 0.05). See Table 4.

Table 4. Predicting emotional product attachment.

	Df	R^2	F	β	t	Sig.
Dependent Variable: Emotional Product Attachment	3	0.30	30.72			0.00**
Utilitarian Motivations				0.11	1.62	0.11
Self-Expressive Motivations				0.43	6.50	0.00**
Clothing Sustainability Knowledge				0.20	3.41	0.00*

*p < 0.01, **p < 0.001.

Addressing RQ#2, the second regression model included environmental attitudes as the dependent variable with the values (i.e., self-expressive motivations, utilitarian motivations, and Clothing Sustainability

knowledge) entered as the independent variables. The overall model was significant (R^2 = 0.37, F= 41.34, p < .001). Results indicated utilitarian motivations and clothing sustainability knowledge significantly predicted environmental attitudes (β = 0.44, t = 7.02, p < 0.001; β = 0.38, t = 6.88, p < 0.001, respectively). Self-expressive motivations did not predict environmental attitudes (β = 0.02, t = 0.23, p > 0.05). See Table 5.

Table 5. Predicting environmental attitudes.

	Df	R^2	F	β	t	Sig.
Dependent Variable: Environmental Attitudes	3	0.37	41.34			0.00**
Utilitarian Motivations				0.44	7.02	0.00**
Self-Expressive Motivations				0.02	0.23	0.82
Clothing Sustainability Knowledge				0.38	6.88	0.00**

**p < 0.001.

To answer RQ #3, three sets of multiple regression analyses were conducted with each of the three sustainable apparel behaviors (i.e., SAB1 pre-purchase behaviors, SAB2 longevity behaviors, SAB3 mindful consumption behaviors) entered as dependent variables and emotional product attachment and environmental attitudes entered as independent variables. All three of the models were significant (R^2 = 0.11, F = 12.67, p < 0.001; R^2 = 0.17, F = 21.92, p < 0.001; R^2 = 0.21, F = 28.68, p < 0.001, respectively). Further, results indicated both emotional product attachment and environmental attitudes positively predicted SAB1 pre-purchase behaviors (β = 0.24, t = 3.63, p < 0.001; β = 0.18, t = 2.71, p < 0.01, respectively), SAB2 longevity behaviors (β = 0.20, t = 3.23, p < 0.01; β = 0.32, t = 5.04, p < 0.001, respectively), and SAB3 mindful consumption behaviors (β = 0.20, t = 3.17, p < 0.01; β = 0.38, t = 6.12, p < 0.001, respectively). See Table 6.

Table 6. Predicting sustainable apparel behaviors.

	Df	R^2	F	β	t	Sig.
Dependent Variable: SAB1—Pre-Purchase Behaviors	2	0.11	12.67			0.00**
Emotional Product Attachment				0.24	3.63	0.00**
Environmental Attitudes				0.18	2.71	0.01*
Dependent Variable: SAB2—Longevity Behaviors	2	0.17	21.92			0.00**
Emotional Product Attachment				0.20	3.23	0.00*
Environmental Attitudes				0.32	5.04	0.00**
Dependent Variable: SAB3—Mindful Consumption Behaviors	2	0.21	28.64			0.00**
Emotional Product Attachment				0.20	3.17	0.00*
Environmental Attitudes				0.38	6.12	0.00**

*p < 0.01, **p < 0.001.

The next regression model addressed RQ#4 with general sustainable behaviors entered as dependent variable and emotional product attachment and environmental attitudes entered as independent variables. The overall model was significant (R^2 = 0.26, F = 37.15, p < 0.001) and results indicated emotional product attachment and environmental attitudes positively influenced general sustainable behaviors (β = 0.17, t = 2.91, p < 0.01; β = 0.44, t = 7.39, p < 0.001, respectively). See Table 7.

Table 7. Predicting general sustainable behaviors.

	Df	R^2	F	β	t	Sig.
Dependent Variable: General Sustainable Behaviors	2	0.26	37.15			0.00**
Emotional Product Attachment				0.17	2.91	0.00*
Environmental Attitudes				0.44	7.39	0.00**

*p < 0.01, **p < 0.001.

DISCUSSION

This study aimed to understand consumers of mass customization apparel (MCA) and their sustainability-related behaviors. Following the value-attitude-behavior hierarchy, this study examined four research questions with specific variables, including motivation for MCA purchases (MMP), clothing sustainability knowledge (CSK), emotional product attachment (EPA), environmental attitudes (EA), sustainable apparel behaviors (SAB), and general sustainable behaviors (GSB). Data collected from 220 actual MCA consumers provided further insights and answers to the research questions.

Regarding RQ #1, findings suggested that participants who were motivated to purchase MCA for its unique features, enjoyable process, and reported higher levels of knowledge about sustainability impacts of the fashion industry were more likely to feel strong bonds and attached to the customized apparel products and would keep them longer, which mirrors what current literature has suggested that MCA consumption could help enhance sustainability [31,34,80]. It is noteworthy that the hedonic aspect of mass customization process that helped participants express themselves played a more important role, as compared to clothing sustainability knowledge, in influencing participants' attachment to their customized clothing. As suggested by Mugge, Schoormans, and Schifferstein [81], when a product was used to fulfill a person's desire to differentiate his/herself from others and to define and maintain one's personal identity, this product acquired special meanings to the owner. Individuals are likely to develop stronger attachment to products that are used to express and maintain a personal and unique identity, which, in

turn, helps promote product longevity [81,82]. Additionally, awareness about the sustainability impacts of apparel was found to predict sustainable fashion purchase intention (e.g., [21]), and in the context of mass customization, this study found that sustainability-related knowledge also helped consumers develop stronger attachment, which could, in turn, promote more sustainable disposal behaviors (i.e., keeping clothes longer) [12,34,80].

In addressing RQ #2, this study found that participants' concerns about the environment and willingness to protect the environment through their consumption were predicted by their practical needs for MCA purchases and knowledge about the sustainability impacts of the clothing industry. Regarding the relationship between motivations for MCA purchases and environmental attitude, results showed that participants with stronger utilitarian motivations for customized apparel also displayed stronger environmental attitudes. Echoing the research suggesting that utilitarian consumers who are motivated by customized offerings may prefer to buy green apparel [83], this study also suggested that consumers with practical mind-sets seemed to care more about the environment and would be more willing to reduce consumption to help protect the environment. The findings related to utilitarian motivation and environmental attitudes could represent a recognition among some consumers that apparel product quality could relate to the consumers' ability to keep clothing items longer, thereby reducing the garment's overall environmental impact. The insignificant relationship between the self-expressive motivation and environmental attitude could imply that consumers' hedonic needs do not necessarily coincide with their environmental attitudes or behaviors. The finding seemed, however, contradictory with existing research which has suggested that consumers' hedonic shopping value focusing on festive and emotional benefits provided from shopping activities positively influenced their environmental involvement [84].

Regarding RQ #3, this study found that both emotional product attachment and environmental attitude positively predicted all three aspects of sustainable apparel behaviors, including pre-purchase behavior, longevity behavior, and mindful consumption. In general, how the participants felt about their MCA products and viewed the environment as a whole influenced their behavioral choices through the decision-making process. Specifically, regression results showed that environmental attitude generally had stronger influence in the longevity behaviors and mindful consumption than emotional product attachment; however, emotional product attachment showed more influence in the pre-purchase behavior. In line with the research by Kozar and Hiller Connell [85] who concluded that overall environmental attitudes

significantly predicted environmentally conscious apparel-purchasing behaviors, this study further suggested that when consumers cared more about the environment and acknowledged the impacts of human behaviors on the health of the environment, they were more likely to display sustainable apparel behaviors by buying second-hand clothes, repairing clothes, donating their unwanted clothing, and purchasing higher quality products. This study found that consumers who felt stronger bonds and attachment to their MCA products had the tendency to focus more on evaluation criteria for their clothing purchases (e.g., natural fiber, easy care with lower environmental impacts). While research has shown that consumers in general care less about sustainability related product attributes (e.g., country of origin; organic cotton) [47], data collected from actual MCA consumers seemed to suggest that MCA products with certain sustainability characteristics are more appealing and help create the bonds with the users.

RQ #4 examined the relationships between emotional product attachment/environmental attitudes and general sustainable behaviors. Results showed that general sustainable behaviors such as energy conservation, buying organic food, recycling, and buying environmentally friendly products could be predicted by both emotional product attachment and environmental attitudes. Environmental attitudes especially played a more important role due to its large value of beta weight in the regression model in predicting the behaviors, which mirrored the study by Casaló and Escario [86] who found a positive relationship between environmental attitudes and pro-environmental behaviors (e.g., energy saving; recycling). The finding that emotional product attachment influenced general sustainable behaviors was interesting and could suggest that consumers with a strong emotional bond to their MCA products may be more likely to have stronger attachments to their possessions in general, therefore resulting in more mindful behaviors such as reusing or re-purposing. Research has suggested that sustainable consumption patterns could be encouraged through product design to stimulate attachment between people and products they own [87]. Considering that spillover effects could be witnessed in pro-environmental behaviors [88], further research should be conducted to examine how promoting sustainable apparel consumption could result in positive changes for sustainable behaviors in other domains subsequently.

In relating these findings back to the results addressing RQ#3, it is worth considering the relative consumer awareness of sustainable consumer behaviors, especially noting the different factors that emerged within the SAB variable. Although sustainable apparel pre-purchase

behaviors (Factor 1 of SAB) shared similarities to behaviors measured by the general sustainable behavior variable (GSB) (e.g., buying clothing made of organic fibers compared to buying organic food), regression results indicated that environmental attitudes had minimal influence in sustainable apparel—pre-purchase behaviors (β = 0.18) in comparison to the amount of influence in general sustainable behaviors (β = 0.44). The pre-purchase behaviors in the apparel context were mostly related to design and material choice decisions that the consumer must know to look for prior to purchase; behaviors that were perhaps less widely known and/or practiced for apparel than non-apparel products, such as food [29]. The other factors of sustainable apparel behavior that were revealed through this research (longevity and mindful consumption) included behaviors that did not rely on seeking information, but were instead determined by consumer choices (e.g., wearing second-hand clothing, repairing clothing, and donating or disposing of clothes in an environmentally friendly manner). Thus, separating sustainable apparel behaviors from general sustainable behaviors was worthy of investigation as it provided further insights. On one hand, results showed that environmental attitude was a stronger predictor for apparel longevity behaviors, apparel mindful consumption behaviors, and general sustainable behaviors while emotional product attachment was a better predictor for apparel pre-purchase behaviors. On the other hand, emotional product attachment showed consistent influence in the three factors of the sustainable apparel behavior variable, but a weaker relationship with the general sustainable behavior variable.

CONCLUSIONS AND IMPLICATIONS

Built upon the value-attitude-behavior hierarchy, this study investigated whether there was a linkage between MCA consumers' psychographics and sustainability-related behaviors. Four research questions were developed specifically to guide the examinations of relationships among variables, including motivations for MCA purchases, clothing sustainability knowledge, emotional product attachment, environmental attitude, sustainable apparel behaviors, and general sustainability behaviors. Previous MC and MCA research studies mostly included samples of university students without investigating actual MCA consumers (e.g., [15–19]). To the researchers' knowledge, this was the first quantitative study sampling and understanding actual MCA consumers in the U.S. market. Data provided from the participants showed that their motivations for MCA purchases were fairly connected with their sustainable apparel behaviors and general sustainability behaviors. Consistent with extant research, clothing sustainability knowledge and

environmental attitude continue to be critical in predicting sustainability related behaviors.

There are several theoretical implications provided by this study. First, to the researchers' knowledge, this study was the first study which provided empirical quantitative data to portray the relationship between MCA consumption and sustainability. Particularly, this study suggested that utilitarian and self-expressive motivations for MCA had varying levels of influence in participants' sustainable apparel behaviors and general sustainable behaviors, which advances the understanding of the MCA business model from the consumption perspective. While most MCA research has focused on the sustainability benefits of the business model from the production perspective (e.g., [10,11]), this study helped bridge the existing gap in the literature. Second, existing research focusing on sustainable fashion consumption generally treats the behaviors in an aggregate manner while this study identified three factors of sustainable apparel behaviors (i.e., pre-purchase behaviors, longevity behaviors, and mindful consumption) that spanned across the three different phases of the decision-making process and found that participants' emotional product attachment and environmental attitudes influenced their sustainability-related behaviors differently, which further suggests the need to consider those behaviors in their unique points in the consumer decision-making journey (e.g., evaluation of alternatives, consumption, disposal). Third, the concept of emotional product attachment has been investigated in varying contexts in the past (e.g., [89]). The consensus generated from those studies is that lengthening the product lifecycle by increasing the consumer perception of a products value is a way to stimulate sustainable consumption [81]. The assumption was tested in the current study and the role of emotional product attachment was confirmed in predicting sustainable behaviors, either apparel specific or general.

Additionally, previous sustainable behavior research has considered consumer knowledge of environmental and social issues, and motivation for environmental responsibility as influencing sustainable consumer behaviors but failed to collect actual behavioral data; instead relying on measures of behavioral intention [90]. As such, the inclusion of behavioral measures for generally sustainable consumer behaviors in the examination of MCA consumers in the current study has helped to expand the literature on sustainable consumer behaviors by providing empirical data from the MCA consumer market.

There are multiple managerial implications for the MCA retailers and the apparel industry as a whole. First, it appears that MCA offers the benefit of improving customer-product relationships through the

enjoyable (satisfying) customization experience afforded by the MCA model and emotional product attachment, which has been considered to lead to product care and product longevity—both elements of sustainable consumption behaviors, as suggested by Ackerman et al. [55] that interactive information and personalizing as two strategies for achieving this purpose. The MCA online platform is inherently an interactive outlet and presents a great opportunity for retailers currently engaged in MCA to explicitly promote product care and other sustainability features of the MCA product and production methods. Emphasizing the emotional bonds that can be developed between the consumer and MCA products and the financial and environmental benefits obtained from lengthening the lifetime of the products may help consumers better meet their sustainability goals. Based on the findings of this study, it is believed this enhanced transparency could have a positive effect on consumer satisfaction as well. This study further suggests that non-MCA retailers should consider incorporating MCA options into their product offerings as part of larger sustainability initiatives as it could provide further opportunities to improve the consumer-retailer relationship (e.g., brand loyalty, word of mouth behavior).

Further, according to the Sustainable Development Goals (SDGs), the target goal 12.8 includes an indicator, “Ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature by 2030” [91]. The results of the current study clearly reflected the essence of the statement that communicates the strong need for knowledge building towards a more sustainable outlook, especially relating to the information that is provided to the consumer at the point of purchase to increase awareness of sustainable production factors, such as the relative benefits of organic or recycled content (e.g., fabrics or dyes).

Despite the research merits of the study, this study suffers from a few limitations that should be addressed by future researchers. First, in considering the participant population compared to a representative national sampling, previous research has suggested the MTurk population represents a lower income sample than a representative national sample [92], which seems to be reflected in this data sample (average income approximately $50,000) as U.S. Census Bureau figures reported the median household income of $69,000 for 2019 [93]. Researchers should consider utilizing more purposive and non-MTurk sampling methods to obtain a more representative sample for similar studies. Second, this research was one of the few studies that included data from actual MCA consumers and suggests that there was a relationship between MCA consumption and sustainability. Data regarding how long the participants kept their MCA

products, however, were not collected. Considering that the online MCA market was still in its infancy, many participants might not have owned their MCA products for a very long time at the time of data collection. Thus, studying MCA product longevity was not the focus in the current study. It would be beneficial for future researchers to investigate whether consumers who have owned MCA products for a longer time would show a higher tendency for sustainability. By the same token, future studies may investigate whether and how MCA consumers are different from non-MCA consumers. Findings of the research could provide further managerial implications for practitioners. Third, the study investigated the relationships among the variables of research interest without examining the causal directions of those relationships. Future researchers may conduct path analysis or structural equation modeling to confirm the relationships and provide further understanding among those variables. Behavioral indicators measured based on behavior frequency (1 = never to 7 = always) such as buying clothing that is made with recycled content, buying organic food, or recycling household waste were utilized in the current study to establish the potential connection between MCA consumption and sustainability-related behavior variables. In the future, researchers could also consider measuring actual behaviors based on the number of sustainable apparel items purchased within a certain period. Further, the relationships in the current conceptual framework suggest the possibility of mediator roles for emotional product attachment and environmental attitude in the relationships between motivations for MCA purchase/clothing sustainability knowledge and sustainable apparel behaviors/general sustainable behavior, further mediation analyses are recommended to confirm such roles. Lastly, this study measured clothing sustainability knowledge based on participants' own perceptions (i.e., subjective knowledge) without recording their actual levels of knowledge (i.e., objective knowledge). Although subjective knowledge has been found more crucial in predicting consumer behavioral intention (e.g., recycling), how objective knowledge would play a role in MCA purchases and subsequent sustainability-related behaviors is still unknown. Additionally, future studies may include experimental design to uncover whether and how sustainability-focused promotion strategies can effectively attract consumers and bring greater insights into sustainable consumption of MCA products.

DATA AVAILABILITY

The dataset of the study is available from the authors upon reasonable request.

AUTHOR CONTRIBUTIONS

Both of the authors designed the study and wrote the paper in collaboration with each other. The corresponding author collected and analyzed the data as part of her Master's thesis project.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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