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Japan Advanced Institute of Science and Technology

Doctoral Dissertation

Proposing a Procedural Method for Promoting Sustainable Clothing Disposal Behavior through Identifying Factors for Sustainable Clothing Consumption

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Abstract

1. Research Content

Background

This study focuses on the sustainable clothing disposal behavior among Chinese consumers, addressing challenges to environmental sustainability. To enable effective clothing disposal behavioral change interventions, understanding consumers' current clothing consumption behavior and applying theoretical recommendations is crucial. However, there is a lack of studies proposing methods for promoting sustainable clothing disposal, identifying issues throughout the purchase, use, and disposal phases based on behavior categories, and introducing theory-based interventions.

Research objectives

The main research objective (***MRO***) of this thesis is to propose a procedural method that promote sustainable disposal behavior in China. Accordingly, this research comprises two sub-objectives: the first sub-objective (***SRO1***) aims to identify the clothing consumption issues that need to be addressed through examining the factors related to sustainable clothing consumption based on the categorization of Chinese consumers' behavior. The second sub-objective (***SRO2***) focuses on developing a method for promoting sustainable clothing disposal behavior among generation Y Chinese female consumers based on the identified categorization of behavioral issues.

Design/methodology/approach

To fulfill ***SRO1***, ***Study 1*** presents the factors for the clothing consumption behavior categorization of Chinese consumers and identifies the environmental issues that need to be addressed in current clothing consumption behavior. A matrix approach was employed to categorize clothing consumption behavior, and the factors for clothing consumption behavior categorization were identified by conducting statistical tests to compare variables related to clothing consumption behavior across the purchase, use and disposal phases. To achieve ***SRO2***, ***Study 2*** initially explores barriers and facilitators of sustainable clothing disposal behavior through thematic analysis using the Capability, Opportunity, and Motivation (COM) components and TDF domains, focusing on one of the issues identified in ***Study 1*** as a case study, followed by quantitative extraction of main barriers and facilitators. Subsequently, using the frameworks of Behavior Change Wheel (BCW), intervention functions, policy categories, behavior change techniques (BCTs), and modes of delivery are identified for each main barrier and facilitator.

Findings

Study 1 identifies factors influencing consumption behaviors, including gender, age, brand preference, annual expenditure on clothing, the number of new clothing items, purchase priorities, disposal reason, disposal channels, disposal quantity, repair experience this year, duration of use, price, and clothing type. Recommendations related to the issues need to be addressed are provided for each behavior category based on the identified influential factors.

Based on the disposal issues identified in ***Study 1***, ***Study 2*** designs a method aimed at promoting sustainable clothing disposal among female consumers of Generation Y. This process initially identifies main barriers and facilitators regarding disposal of unused clothing and the usage of online clothing recycling platforms using COM and TDF. Consequently, step-by-step delineations of intervention functions, policy categories, BCTs, and modes of delivery are systematically outlined for each factor

2. Research Significance

This research creates new values by integrating knowledge from diverse fields, including sustainability, clothing consumption, and behavior change, thereby facilitating problem-solving and informed decision-making within society. It provides several significant academic contributions. It categorizes consumers' behavior to identify factors related to

sustainable clothing consumption throughout the entire consumption phases, including purchase, use, and disposal. It expands the application of theoretical frameworks and methods in several ways: Firstly, the mixed inductive-deductive approach in thematic analysis enhances understanding of the various factors influencing sustainable clothing disposal behaviors. Secondly, the application of statistical analysis aids in the identification of main barrier and facilitator factors related to behavior issues. Thirdly, TDF domain refinement provides a nuanced understanding of contextual forces shaping clothing disposal behavior. Lastly, simplification of intervention and implementation options enhances the identification of effective behavior change strategies.

Study 1 provides a comprehensive understanding of clothing consumption, including variations in different phases of clothing consumption, within the context of environmental sustainability. The findings also provide a foundation for developing interventions to promote behavioral change. The insights provide valuable insights for policymakers, educators, stakeholders in the clothing industry, and consumers. ***Study 2*** develops a comprehensive method for promoting sustainable clothing disposal based on the specific clothing disposal issues observed among Chinese female consumers from Generation Y. The study effectively incorporates the guidance of the BCW-related frameworks to effectively address these issues. The step-by-step options outlined in this case study serve as an exemplary model for conducting research on behavior change interventions related to clothing consumption and are relevant to policymakers and stakeholders involved in the sustainable clothing disposal field.

Keywords sustainable clothing consumption; categorization of behavior; factors for sustainable clothing consumption; barriers; facilitators; intervention functions, policy categories, BCTs, mode of delivery

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It is my honor to have had the opportunity to undertake this research and complete my thesis at Japan Advanced Institute of Science and Technology (JAIST). After fifteen years since obtaining my master's degree, studying at JAIST, a prestigious institution with advanced educational resources, has been of immense significance to my life.

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List of Abbreviations

APEASE	Affordability, Practicability, Effectiveness/Cost-effectiveness, Acceptability, Side-effects/safety, Equity
BCTs	Behavior Change Techniques
BCTTv1	Behavior Change Technique Taxonomy
BCW	Behavior Change Wheel
COM	Capability Opportunity and Motivation
COM-B	Capability Opportunity Motivation–Behavior
IWHF	Items Worn with the Highest Frequency
L-A	Category of Large–Active
L-P	Category of Large-Passive
MRO	Main Research Objective
NAWEI	Number of Average Wears of Each Item
OCRP	Online Clothing Recycling Platform
S-A	Category of Small–Active
S-P	Category of Small–Passive
SRO1	First Sub-Objective
SRO2	Second Sub-Objective
TCI	Total Clothing Items
TCI-1	The Total Number of Used Clothing Items
TCI-2	The Total Number of Unused Clothing Items
TDF	Theoretical Domains Framework
WHFI	Wears of the Highest-Frequency Items

Chapter 1. Introduction

1.1 Research background

The clothing industry has become one of the most polluting industries worldwide, contributing to environmental pollution and excessive energy consumption throughout its production, distribution, and consumption (Gwilt, 2020). This increased environmental impact is promoted by both suppliers and consumers (Cooper, 2004; Gwozdz et al., 2017). While considerable efforts have been devoted to improving the production stage, little attention has been paid to improving consumption behavior (Laitala & Klepp, 2020). With the growing number of purchased, used, and discarded clothes, the current clothing consumption pattern negatively affects the clothing lifespan, becoming a primary environmental challenge (De Wagenaar et al., 2022; Fletcher, 2012, 2014; Jung & Jin, 2016; Kim & Choo, 2020; Laitala & Klepp, 2015; Paço et al., 2021). A particular concern is the rapid development of fast fashion in the past decade, which advocates for high-volume, low-cost consumption, and has hence continuously accelerated environmental impact through increased consumption rates (Fletcher, 2014; Henninger et al., 2016; Koo & Ma, 2019; Laitala & Klepp, 2015). However, consumers generally have limited awareness and knowledge of sustainable consumption behavior, resulting in a large number of clothing items being purchased with inefficient use and irrational disposal (Fletcher, 2012; Haug & Busch, 2016; Joung & Park-Poaps, 2013; Laitala & Klepp, 2015; Paço et al., 2021). It is reported that approximately 26 million tons of used clothing are discarded into landfills in China each year, which is expected to reach around 50 million tons by 2030. Shockingly, the recycling rate for these garments is less than 1%, and the majority of them have not undergone remanufacturing or harmless disposal treatments (Xinhuanet, 2016). Such consumption patterns require urgent transformation through behavioral change interventions aimed at enhancing consumer awareness of the environmental impact of their daily consumption (Liang & Xu, 2017b). This, in turn, requires a comprehensive understanding of consumer behavior (Zhang & Hale, 2022), which is based on the categorization of consumers' consumption behavior across purchase, use, and disposal phases. Furthermore, it necessitates theory-based interventions that are practical, accessible, and usable (Michie et al., 2014).

Despite the importance of understanding consumer behavior in the context of sustainable clothing consumption, only a few studies, such as Gwozdz et al. (2017), have explored consumer categories based on clothing consumption across the purchase, use, and disposal phases and have proposed intervention directions by

characterizing each category. Furthermore, limited research has focused on the clothing use phase, as its details cannot be determined as easily as in the purchase phase. Studies that do examine the use and maintenance phases often investigate maintenance practices, such as washing and drying (Ackermann, 2018; Gray, 2017; Gwozdz et al., 2013; Laitala et al., 2018). Similarly, studies on the disposal phase tend to focus on the reasons, channels and motivations behind clothing items that have been disposed of, relying on consumers' estimations or assumptions derived from surveys (Fenitra et al., 2021; Laitala, 2014). These studies often overlook the underlying factors that contribute to clothing items not being disposed of, thereby generating uncertainty about the actual disposal practices and diminishes the anticipated benefits (Haug & Busch, 2016). Additionally, except for Gainforth et al. (2016) and Zhang and Hale (2022), few studies propose behavior change intervention methods based on theoretical frameworks in the context of environmental sustainability. Such frameworks have primarily been implemented in the fields of implementation science and health (Michie et al., 2014). Consequently, within the context of sustainable clothing consumption, a literature gap exists regarding interventions that promote sustainable clothing consumption through an in-depth understanding of consumers' behavior based on categorization.

1.2 Scope of the research

The research context of this doctoral study focuses on the sustainable clothing consumption behavior of Chinese consumers. The global increase number in clothing consumption has had negative impact on the environment (Fletcher, 2012, 2014; Jung & Jin, 2016; Kim & Choo, 2020; Paço et al., 2021). The emergence of fast fashion, characterized by its affordability and constant introduction of new styles, has further accelerated this trend (Gwozdz et al., 2017; Joung & Park-Poaps, 2013; Joy et al., 2012). China, as the world's largest textile and clothing exporter, producer, and consumer (Guan et al., 2019; Xu et al., 2022), has experienced a significant increase in environmental challenges stemming from the fashion and textile industry (Zhang et al., 2020).

Due to limited awareness and knowledge, a significant number of clothing items are purchased with inefficient use and disposed of irrationally (Fletcher, 2012; Haug & Busch, 2016; Joung & Park-Poaps, 2013; Laitala & Klepp, 2015; Paço et al., 2021). Moreover, as one of the major carbon dioxide emitters globally, China faces the significant challenge of reaching its peak CO2 emissions by 2030 and achieving carbon neutrality before 2060 (Liu et al., 2022). Existing literature emphasizes the importance of targeted interventions that promote changes in clothing consumption

behavior, which should be based on a comprehensive understanding of consumers' current behavior (Gwozdz et al., 2017). In light of these circumstances, this study aims to examine the clothing consumption behavior of Chinese consumers by categorizing them and identifying the issues that need to be addressed across the purchase, use, and disposal phases within each category. Subsequently, a case study is conducted to develop a procedural method with a series of intervention and implementation options that specifically target the identified clothing disposal issues within a particular category, aiming to promote sustainable clothing disposal behavior.

1.3 Significance of the study

This study holds significant importance for various stakeholders involved in the clothing industry and sustainable consumption. By offering valuable insights and proposing behavior change interventions, it aims to provide recommendations and insights to promote sustainable disposal practices for policymakers, educators, stakeholders in the field of clothing, and consumers.

To fill the existing literature gap, this doctoral research combines both quantitative and qualitative approaches. It identifies the critical issues in clothing consumption across the purchase, use, and disposal phases that need to be addressed through examining the factors related to sustainable clothing consumption based on the categorization of Chinese consumers' behavior. The categorization of clothing consumption behavior is based on evidence obtained through consumers' daily photograph logs and a wardrobe survey conducted in a wardrobe study, ensuring a solid foundation for analysis. Additionally, the study designs a method aimed at promoting sustainable clothing disposal among female consumers of Generation Y. This process initially identifies main barriers and facilitators regarding disposal issues. It expands the application of Behavior Change Wheel (BCW) frameworks through several key methods: 1) Employing a mixed inductive-deductive approach to identify factors related to behavior issues; 2) Statistically extracting main barrier and facilitator factors; 3) Refining the broad domain of the Theoretical Domains Framework (TDF) into sub-domains; and 4) Simplifying option identification through pre-evaluation. Subsequently, the step-by-step delineations of intervention functions, policy categories, behavior change techniques (BCTs), and modes of delivery are systematically outlined for each barrier or facilitator factor, guided by BCW-related frameworks. The extended application of these frameworks, commonly used in the fields of science and health, into the study's design adds depth and effectiveness to the proposed interventions. Furthermore, unlike most deductive thematic analyses, this study employs a combination of deductive and inductive approaches. This

approach allows for the categorization of inductive themes into COM components and TDF domains, enhancing the understanding of the factors influencing sustainable clothing disposal behaviors. To the best of our knowledge, this is the first case study that utilizes the BCW-related frameworks to examine existing clothing disposal behaviors with the aim of informing intervention design. By addressing this research gap, the study contributes to the development of effective interventions and practices in the clothing industry. It provides valuable guidance to stakeholders by promoting sustainable consumption behaviors, fostering environmental responsibility, and advancing the field of sustainable fashion.

Overall, the significance of this study lies in its comprehensive approach, integration of theoretical frameworks, and the generation of practical insights for stakeholders involved in the clothing industry. It has the potential to drive positive change, support sustainable consumption efforts, and shape the future of the clothing industry towards more responsible and conscious practices.

1.4 Research objectives

The main research objective **(MRO)** of this thesis is to propose a procedural method that promote sustainable disposal behavior in China.

Accordingly, this research comprises two sub-objectives: the first sub-objective ***(SRO1)*** aims to identify the clothing consumption issues that need to be addressed through examining the factors related to sustainable clothing consumption based on the categorization of Chinese consumers' behavior. The second sub-objective ***(SRO2)*** focuses on developing a procedural method for promoting sustainable clothing disposal behavior among generation Y Chinese female consumers based on the identified categorization of behavioral issues. There is a strong relationship between ***SRO1*** and ***SRO2***, as achieving ***SRO2*** will require a thorough understanding of clothing consumption behaviors with the identifications of areas that require change based on specific consumer categories. Fulfilling ***SRO1*** will involve identifying main barriers and facilitators related to behavioral issues and enacting a series of intervention and implementation options within a theoretical framework through a case study. Ultimately, successfully achieving these two sub-objectives will fulfill the ***MRO***. Figure 1 demonstrates the process of fulfilling sub-objectives in order to accomplish the ***MRO***.

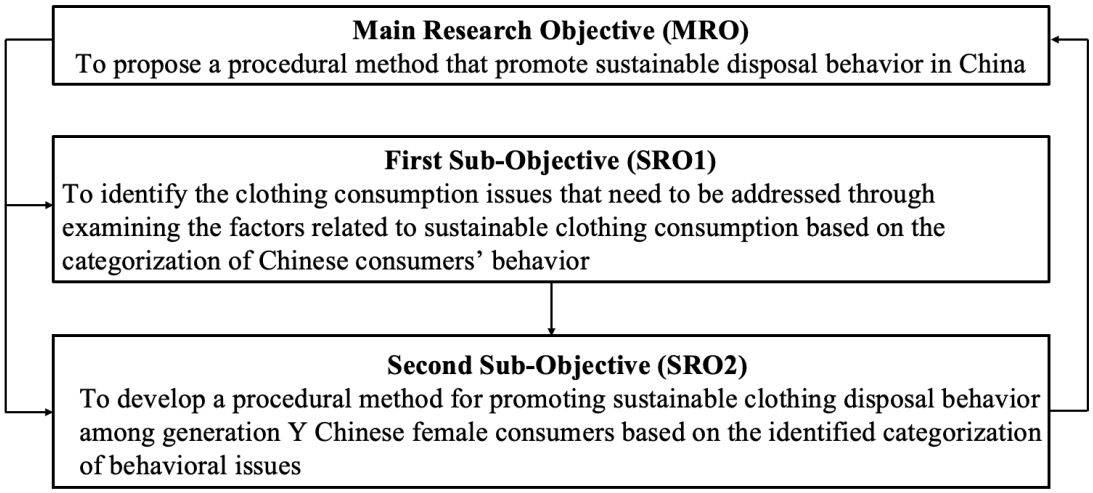

Figure 1. Relationship of the research objects.

1.5 Structure of the thesis

This thesis consists of the following seven chapters.

Chapter 1 (Introduction) provides an overview of the research, the background of the research problem, the research objectives, and the significance of the thesis.

Chapter 2 (Literature Review) describes the contextual framework of the study and critically reviews the literature on sustainable consumption behavior and factors related to sustainable clothing consumption. This chapter also establishes the theoretical foundation for proposing behavior change interventions to promote sustainable disposal behavior.

Chapter 3 (Research Methodology) presents an overview of the quantitative and qualitative methods employed in this thesis. It also justifies the selection of these methods in addressing the research questions. The chapter provides detailed information on research design, data collection, measurement, and analysis procedures.

Chapter 4 (Results of ***Study 1***) presents categorization of clothing consumption behavior of Chinese consumers based on their actual clothing use behavior. It also identifies the factors that influence different categories of clothing consumption behaviors, thereby identifying the clothing consumption issues affect the environment that need to be addressed. Therefore, this chapter addresses the ***SRO1***.

Chapter 5 (Results of ***Study 2***) presents the method aimed at promoting sustainable clothing disposal among female Chinese consumers of Generation Y. This method initially identifies main barriers and facilitators regarding disposal of unused

clothing and the usage of online clothing recycling platforms (OCRPs) using COM and TDF frameworks. The main barriers and facilitators include the factors related to the COM components of reflective motivation, physical opportunity, social opportunity, and psychological capability. Secondly, intervention functions are identified by mapping the identified barriers and facilitators within TDF domains, using linkage matrices guided by the BCW. Thirdly, policy categories are identified by mapping the identified intervention functions through linkage matrices guided by the BCW. BCTs are selected from the "most/less frequently used BCTs" list from Michie et al. (2014) and the Behavior Change Technique Taxonomy (BCTTv1) based on the identified intervention functions. Lastly, modes of delivery are selected using the "Taxonomy of modes of delivery for intervention function that involve communication" based on the identified BCTs. Each option is pre- and post-evaluated using the APEASE criteria (affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety, equity) to simplify and substantiate identification process. Therefore, this chapter addresses the ***SRO2***.

Chapter 6 (Discussion and Conclusion) summarizes the categorization of clothing consumption behavior of Chinese consumers and the factors related to sustainable clothing consumption. It discusses the method for promoting sustainable clothing disposal behavior among Chinese female consumers of Generation Y, based on the identified behavior categorization issues.

Chapter 7 (Limitation, Future Research and Contribution) outlines limitation, suggests areas for further research, and the thesis's contributions.

Chapter 2. Literature Review

2.1 Sustainable clothing consumption

2.1.1 Definition of sustainable consumption

Consumption is intricately connected to sustainability, as consumers' choices regarding what and how much to buy, how to utilize, and how and when to dispose of products directly affect the environment and future generations (Soyer & Dittrich, 2021; Trudel, 2019). The collective impact of each individual's consumption can have significant and far-reaching consequences (Trudel, 2019). Clothing serves both a functional purpose of protection and a means of self-expression, connecting with symbols like brands, status uniqueness, appropriateness, and aesthetics (Kaiser, 1997). Operating within a dynamic cycle (Armstrong et al., 2015; De Wagenaar et al., 2022), the fashion industry creates a cultural loop of innovation, enabling consumers to adopt and eventually discard a continuous succession of transient styles and aesthetics, effectively detaching clothing from its original purpose (Fletcher, 2014). Consumers purchase clothing for various motives, such as social identity, entertainment, or replacement (Armstrong et al., 2015; Fletcher, 2014). However, the large volume of clothing consumption and textile waste poses environmental harm, conflicting with sustainability aspirations. (Fletcher, 2014; Joung & Park-Poaps, 2013; Morgan & Birtwistle, 2009).

Sustainable consumption has been defined variably by researchers. The Oslo symposium defined it as "the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of further generations" (Oslo symposium, 1994). Sustainable consumption behavior involves individuals being conscious of the long-term impact their consumption choices have on the natural and social environment (Epstein & Buhovac, 2008). Abdulrazar and Quoquab (2018) and Jaron et al. (2005) described sustainable consumption as an economic activity of selecting, utilizing, and disposing of goods and services in ways that promote social and environmental benefits, with its primary objective being to drive positive changes in consumption behavior and foster social transformation to achieve favorable environmental outcomes. Wolf and Schönherr (2011) emphasized that sustainable consumption as a socially and environmentally conscious approach to

the purchase, use, and disposal of products and services.

Within the context of sustainable clothing consumption, the definition encompasses the purchase, use, and disposal phases (Jacoby et al., 1977). In this study, we focus on the environmental perspective of sustainable consumption. Applied to sustainable clothing consumption behaviors, these definitions imply the following actions (Rhee & Johnson, 2019; Soyer & Dittrich, 2021):

(1) Sustainable purchase phase: Individuals are encouraged to reconsider their purchasing habits by choosing high-quality garments and limiting the total number of clothing items they acquire.

(2) Sustainable use phase: This phase involves prolonging the clothing use period of clothing, enhancing usage frequency, and engaging in repairing and repurposing clothing when necessary to extend their lifespan.

(3) Sustainable disposal phase: In this phase, the focus is on behaviors that limit the amount of waste entering landfills. This includes practices such as reuse, recycling, and repurposing, rather than simply discarding them.

2.1.2 Clothing consumption phases: Purchase, use and disposal

Purchase phase

The purchase phase of clothing consumption plays a crucial role in shaping sustainable clothing practices (Gwozdz et al., 2017). The purchase phase is intricately connected to consumers' use and disposal behaviors, emphasizing the interdependence of these stages (Gwozdz et al., 2017; Soyer & Dittrich, 2021). The inflow of clothing items that consumers purchase influences the number of items they own (De Wagenaar et al., 2022). The attributes chosen for clothing items significantly influence how they are used, maintained, and ultimately disposed of (Gwozdz et al., 2017; Laitala et al., 2018; Lang et al., 2013). Research suggests that individuals with higher levels of clothing purchase tend to dispose of their garments more frequently (Birtwistle & Moore, 2007; Joung & Park-Poaps, 2013; Lang et al., 2013). Consumer purchasing decisions are influenced by their anticipated use and desired functionalities of clothing items (Birtwistle & Tsim, 2005). Characteristics such as clothing function, aesthetics, durability, and comfort are key considerations during the purchase phase, as they directly impact the consumer's satisfaction and overall experience during the use phase (Aakko & Niinimäki, 2021).

In recent decades, there has been a significant increase in the volume of clothing purchases across various countries. For instance, in the United States, the

average consumer bought 64 clothing items per year, spending approximately $907 in 2013 (Apparel Stats, 2014). Similarly, in Sweden, the consumption of clothing and shoes witnessed a 53% increase from 1999 to 2009 (Roos et al., 2015). In China, according to data from the China E-Commerce Research Center, online clothing shopping reached an astounding scale of approximately 934.3 billion yuan (RMB) (around US$13 billion) in 2016 (Finance China, 2017). The substantial global purchase volume and high demand for clothing present a significant challenge to the environment (Bick et al., 2018).

Fast fashion is one of the reasons that lead to the growing clothing purchases volume (Soyer & Dittrich, 2021). The rise of fast fashion has exerted a profound influence on consumers' purchase behavior, influencing sustainability outcomes (Fletcher, 2014; Lang et al., 2013; Peters et al., 2021; Soyer & Dittrich, 2021). The affordability and constant introduction of new styles by fast fashion brands have led to increased impulse buying, frequent clothing turnover and ease replacement (Gwilt & Pal, 2017; Joung & Park-Poaps, 2013; Joy et al., 2012). Fast fashion garments are typically designed with a short lifespan in mind, resulting in a higher frequency of new product purchases (Bianchi & Birtwistle, 2010). The desire to stay fashionable and keep up with rapidly changing trends often drives consumers to make purchases without careful consideration of the long-term use and disposal of the clothing items (Lang et al., 2013).

Furthermore, the emergence of online shopping channels, with their perceived convenience, cost-effectiveness, and time-saving benefits (Wei et al., 2018), facilitating a significant volume of clothing purchases as an integral part of the purchase phase (Ladhari et al., 2019; Wei et al., 2018).

Use phase

As the middle phase of clothing consumption, clothing use behavior plays an important role and connects with other phases of consumption (Ackermann, 2018; Guo & Kim, 2021; Gwozdz et al., 2017). Since consumers' number of clothing items is determined by the number of items they own, their inflow through purchases, and outflow through disposal (De Wagenaar et al., 2022), the lifespan of owned clothing is determined by the number of times a garment has been worn (usage frequency), resulting in a division into active, passive, and unused items (De Wagenaar et al., 2022; Fletcher, 2012; Laitala & Klepp, 2015; Maldini et al., 2019) (see Figure 2). Positive use behavior is associated with frequent wear (active use) and owning clothing items in numbers that correspond to the demand, which improves the clothing lifespan (Fletcher, 2012; Laitala & Klepp, 2015; Maldini et al., 2019). In contrast, negative use behavior is associated with infrequent wear (passive use/unuse)

and owning more clothing than is necessary, which can shorten the clothing lifespan (Blum, 2021; De Wagenaar et al., 2022; Laitala & Klepp, 2015).

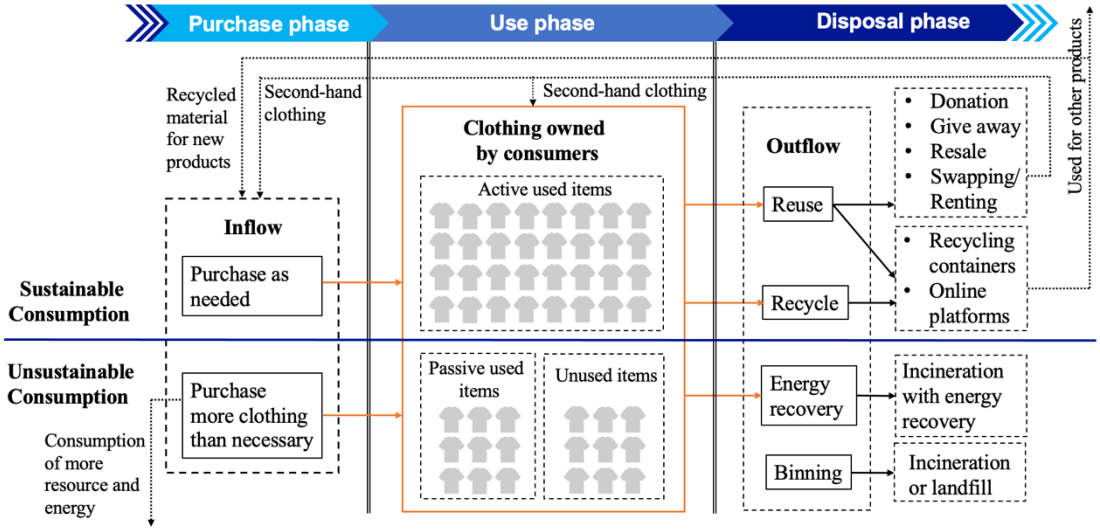

Figure 2. The relationship between phases of purchase, use and disposal.

Despite the claim by Klepp et al. (2020) that clothing lifespan can be measured by its length of use apart from its frequency of wearing, since longer use times are associated with sustainable use behavior, the fact remains that having a large number of clothing items may lead to some clothing being rarely worn; for example, certain items may only be used for a single season, worn once during a designated time period, or never worn at all (Laitala & Klepp, 2015; Rhee & Johnson, 2019). These passive usage behaviors represent unsustainable practices and are often disregarded in terms of their environmental impact (Smith, 2018). In other words, it is insufficient to measure the use behavior of rarely used clothing items only based on the number of years that consumers have owned them; passive use or disuse, even in long-term ownership, is not sustainable. It is more efficient to measure usage frequency in such a context.

Repairing and repurposing, as part of use phase, encompasses four related categories (Connor-Crabb & Rigby, 2019; Laitala et al., 2018): (1) Repairing, involves restoring a faulty or damaged clothing item to a functional state such as sewing a seam that has come undone (Niinimäki & Armstrong, 2013); (2) Altering, refers to adjusting the fit of a clothing product, such as hemming trousers to achieve the desired length (Janigo & Wu, 2015); (3) Upcycling, entails transforming unwanted clothes into something aesthetically valuable, for example, transforming trousers into shorts (Janigo & Wu, 2015); (4) Repurposing, involves changing the form of a garment for a new use, such as turning a t-shirt into rags (Laitala et al., 2018; Palmsköld, 2015). Repairing and altering contribute to extending the lifespan of clothing products, while upcycling and repurposing prolong their material life (Laitala

et al., 2021). Since repairing and repurposing are also associate with the end-of-life extension of clothing, they also belong to disposal phase behavior (Degenstein et al., 2020). However, research has indicated that the availability of cheap products, particularly fast-fashion items, has made it economically and aesthetically unappealing to repair old garments. In many cases, the cost of purchasing new clothing has become more affordable than the expense associated with repairing existing items (Aakko & Koskennurmi-Sivonen, 2013; Chris & Elyse, 2013). The lack of service providers and concerns about perceive cost, time, and required skills also presents an obstacle to engaging in repair behaviors (McLaren & McLauchlan, 2015; Zhang & Hale, 2022).

Disposal phase

Clothing disposal behavior refers to the practice of discarding undesired clothes (Wai Yee et al., 2016) at their end-of-life stage with the current owner (Degenstein et al., 2021; Laitala, 2014). Consumers' decisions on why and how to dispose of unwanted clothing directly influence the lifespan of the clothing, the quantity of waste produced, possibilities for reuse and recycling, and product replacement decisions (Cruz-Cárdenas & Arévalo-Chávez, 2018; Degenstein et al., 2021; Laitala, 2014; Wang et al., 2020). Similar to the purchase phase, the outflow of clothing items that consumers dispose of also influences the number of items they own (De Wagenaar et al., 2022) (see Figure 2).

Clothing disposal channels generally consist of four categories: reusing, recycling, recovering and binning (Bukhari et al., 2018; Degenstein et al., 2021) (See Figure 3). Reusing refers to clothing products in satisfactory conditions being used again after cleaning, sorting, and repairing (Laitala, 2014), including channels such as donation, giving away, resale, swapping, and renting (Degenstein et al., 2021; Joung & Park-Poaps, 2013; Wai Yee et al., 2016; Wang et al., 2020). Recycling involves the conversion of unwearable clothing into new products (Laitala, 2014). Recycling containers, which can be found in community or retail shops, are used to recycle clothing materials in addition to accepting donations. Reusing and recycling are considered sustainable disposal channels (Wang et al., 2020), as they are sequentially ranked next to the lowest environmental impact step, "prevention of waste occurrence" in the five-step waste hierarchy (Laitala, 2014), This is especially true for reuse, which facilitates prolonged use of clothing (Cruz-Cárdenas et al., 2017; Joung & Park-Poaps, 2013). Recovery refers to the conversion of energy from one form to another, such as incineration with energy recovery (Gwozdz et al., 2017; Laitala, 2014). Binning refers to the disposal of clothing without recycling or reusing (Gwozdz et al., 2017; Laitala, 2014), such as landfilling or incineration without

energy recovery. Both recovery and binning are considered disposal methods with high environmental impacts (Gwozdz et al., 2017). Notably, in recent years, an online clothing recycling platform (OCRP) has emerged in China to promote clothing recycling by providing online booking and offline free pick-up door-to-door services (Spuijbroek, 2019; Zhang et al., 2020). As a promising clothing recycling platform, after disinfecting and sorting, OCRP disposes the clothing through reuse and recycling (such as donation, export sales, and industrial material) according to the condition of the collected clothing.

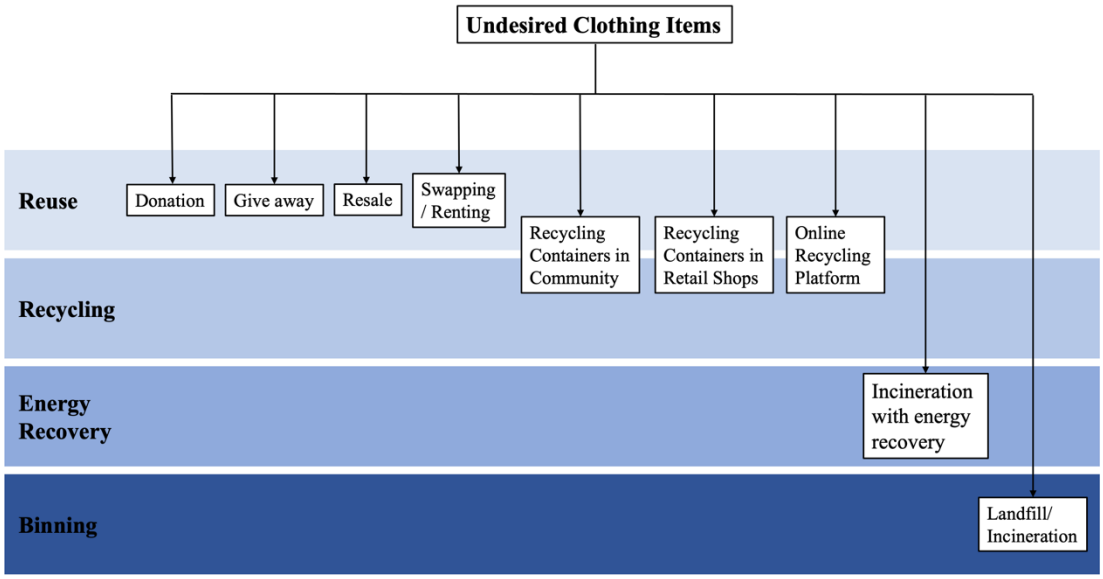

Figure 3. Disposal channels for undesired clothes.

Although a variety of environmentally friendly clothing disposal channels, such as donating, giving away, reselling, renting, and recycling bins are available (Degenstein et al., 2021), it is estimated that roughly 75% of textile waste ends up in landfills worldwide, and only 25% is reused or recycled (Ellen Macarthur Foundation, 2017; Textile Exchanges, 2020).

According to Jacoby's (1977) categorization of factors that influence disposal choices, clothing disposal reasons can be classified into three categories: psychological characteristics of the decision maker (e.g., personality, attitudes, etc.), factors intrinsic to the product (e.g., clothing condition, price, etc.) and situational factors extrinsic to the product (e.g., storage space, events, etc.). Guo & Kim (2021) further elaborate on the factors intrinsic, dividing them into three sub-categories: nature factor (e.g., wear and tear, mis-shaping due to long-term use or frequent washing), quality-driven factors (e.g., damaged or missing trims, pilling or easily fades caused by product quality issues), and maintenance-driven factors (e.g., stains that cannot be removed or being dyed caused by improper maintenance).

Laitala (2014) provided a comprehensive summary of the primary reasons for clothing disposal, which include: (1) wear and tear, (2) fashion or boredom, (3) poor fit, and (4) lack of storage space. The reason of wear and tear is associated with nature factors intrinsic to the product, while fashion or boredom is influenced by the psychological characteristics of the decision maker. Lack of storage space is influenced by situational factors, and poor fit is influenced by both physical characteristics of individuals and the nature factors intrinsic to the product. In subsection 2.1.3, we will delve further into the specific reasons for clothing disposal and explore them in greater detail.

2.1.3 Factors related to sustainable clothing consumption

Consumers' behavior towards sustainable clothing consumption across the purchase, use and disposal phases can be influenced by various factors, including demographics, garment attributes, and clothing practices (French et al., 2012; Gwozdz et al., 2013; Gwozdz et al., 2017; Laitala & Klepp, 2020), as outlined in Figure 4.

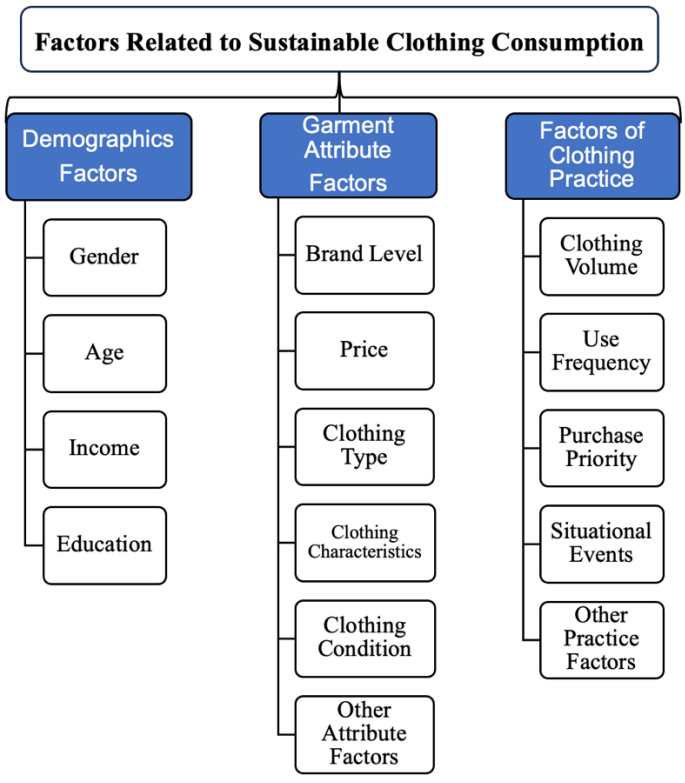

Figure 4. The outline of factors related to sustainable clothing consumption.

Demographics factors

Consumer demographic information significantly affects clothing consumption behavior, and contributes to the measurement of lifespan relatively more than other

factor categories (Laitala & Klepp, 2020).

Gender has a notable effect on total clothing ownership (Laitala & Klepp, 2020). According to Rahman et al. (2020)'s study of young Chinese consumers, women are more concerned with aesthetics (color and style), which relate to visual and sensory attributes, whereas men are more concerned with functional benefits, which correspond to attributes of performance and utilitarianism (Rahman et al., 2020). Women also tend to participate more in fast fashion practices compared to men (Birtwistle & Moore, 2007; Domina & Koch, 1997; Joung & Park-Poaps, 2013; Lang et al., 2013). Laitala and Klepp (2020) found that men's clothing items were more likely to be selected for reuse compared to women's clothing items. Additionally, women play a leading role in clothing disposal decision-making within households (Cruz-Cárdenas et al., 2017) and are more likely to engage in sustainable clothing consumption practices (Cho et al., 2015).

Age also plays a role in clothing consumption behavior, as older consumers tend to own clothing items for longer periods and use them more frequently compare to younger consumers (Laitala & Klepp, 2020). Older consumers also tend to use reuse channels for disposal more often (Bianchi & Birtwistle, 2012; Laitala & Klepp, 2020). It is also found that, older consumers exhibited a higher tendency to engage in self-repair of clothing or repair clothing for others compared to young consumers (Laitala & Klepp, 2018; Laitala et al., 2021). Younger consumers generally prefer lower-priced fast fashion clothing that are trendy and frequently purchased, while older adults prioritize quality over price (Bhardwaj & Fairhurst, 2010). Young consumers with a high sensitivity to fashion tend to dispose of clothing more frequently for fashion-related reasons (Lang et al., 2013; McNeill et al., 2020), and demonstrate significantly lower engagement in the complete clothing disposal process through gifting (Cruz-Cárdenas et al., 2017).

Income level also influences clothing behavior, as individuals with low incomes tend to retain their clothing items for a longer time before disposal (Lang et al., 2013; Zhang et al., 2020). Conversely, higher-income individuals tend to spend more on clothing, opting for casual/medium and premium-priced brands (Gwozdz et al., 2017). Moreover, higher-income individuals tend to dispose of clothing more frequently (Zhang et al., 2020).

Overall, demographic factors, including age, gender, education, life stage, and income, have been shown to influence both disposal methods and environmental attitudes (Hanson, 1980; Harrell & McConocha, 1992; Shim, 1995). Women, younger individuals, and those with higher incomes tend to buy more clothing (Lang et al., 2013). Men, older people, individuals with a lower income, and those who

intentionally choose longer-lasting clothing, affect the active use of clothing (Langley et al., 2013). Individuals from lower income groups, younger age brackets, students, and women exhibited a greater tendency towards clothing reuse (Cruz-Cárdenas et al., 2019).

Garment attribute factors

Garment attributes, including brand level, price, type, characteristics, and condition impact clothing consumption behavior.

Brand level, for instance, has a significant influence, with budget, casual/medium and premium brands attracting different segments of consumers (Gwozdz et al., 2017). Premium brand clothing items tend to be kept longer (Bhardwaj & Fairhurst, 2010), and designer brands are more likely to be repaired when damaged compared to low-cost items (Degenstein et al., 2020). Moreover, brand image and word of mouth strongly influence consumers' interest in clothing purchase (Cham et al., 2018). Furthermore, brand names, which provide indications of the anticipated quality (Aakko & Niinimäki, 2021), and the countries of origin can serve as influential factors in consumers' purchasing decisions and contribute to the justification of their choices (Rahman et al., 2020).

Price is a common factor that affects consumers' purchase decisions (Ryu & Han, 2010), with lower prices often attracting specific consumer segments (Gwozdz et al., 2017). Research suggests that higher prices are associated with a decreased probability of purchase (Lichtenstein et al., 1993), but clothing items with higher prices tend to be used longer and more frequently than lower-priced items (Laitala & Klepp, 2020). Moreover, higher-priced items are more likely to be repaired (Degenstein et al., 2020; Laitala & Boks, 2012). Additionally, price plays a significant role in influencing an individual's intention to purchase sustainable clothing items (Kopplin & Rösch, 2021).

The type of clothing also plays a significant role in determining ownership time and disposal channels (Laitala & Klepp, 2020). Research shows that suits have an average ownership length of 8.7 years, dresses 7.1 years, coats 7 years, jackets/blazers 6.8 years, blouses/shirts 4.8 years, T-shirts 4.6 years, and jeans 3.5 years (Laitala et al., 2017) (see Figure 5). This indicates that the type of clothing directly affects consumers' ownership time. Clothing types, such as casual wear and formal wear, including factors like fit and fabric, as well as specific usage scenarios, can influence the frequency of wearing (Degenstein et al., 2020; Moody et al., 2010). A study by Niinimäki and Armstrong (2013) found that participants reported wearing garment types such as t-shirts and jeans more frequently compared to formal items such as

suits, dresses, or blouses. Additionally, jeans or dress are found to be more likely to be repaired when damaged compared to T-shirt (Degenstein et al., 2020). Furthermore, the type of clothing also influences the disposal channel, such as reuse, repurposing or trashing (Gwozdz et al., 2017). According to Degenstein et al. (2020), fast fashion t-shirts that are severely damaged are more likely to be repurposed for other uses, such as rags.

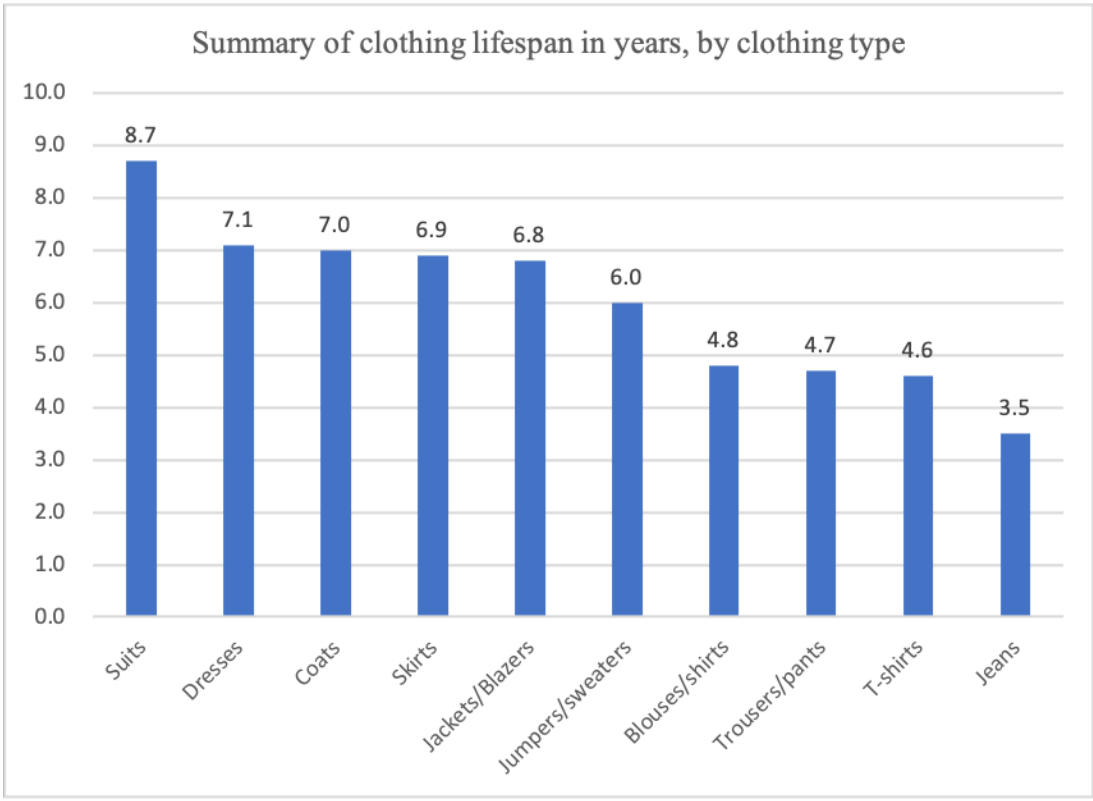

Figure 5. Summary of clothing lifespan in years, by clothing type (Laitala et al., 2017).

Various characteristics of clothing, such as material quality, design, and workmanship, influence consumers' sensory judgement and their choices (McQueen et al., 2022; Tsiotsou, 2006). The fiber content of clothing items, for instance, influences the clothing duration and disposal behavior. Wool clothing items, known for their durability, have been found to be long-lasting (Wiedemann et al., 2021), and are more likely to be selected for reuse compared to cotton clothing items (Laitala & Klepp, 2020). Garments that offer easy repairability, enhanced durability, and extended longevity are more likely to be purchased by consumers (Lou & Cao, 2018). On the other hand, the cheap nature and poor quality of many fast fashion clothing items have been associated with a decrease in clothing repair practices and an increase in textile waste (Laitala & Klepp, 2018; McLaren et al., 2015). The quality of clothing extends the clothing use time (Aakko & Niinimäki, 2021).

The condition of clothing also influences consumers' wearing, disposal or repair

decisions (Smith, 2018). Clothing that is damaged or considered cheap fast fashion is unlikely to be reused by consumers, while clothing that is slightly damaged is more likely to be repaired (Degenstein et al., 2020). Jacoby et al. (1977) found that preference for disposal channels varies with the category of the product, and Degenstein et al. (2021) found that product conditions influence whether consumers choose to throw them away as general waste. Participants in the study conducted by Collett et al., (2013) reported that they stopped wearing clothing items primarily due to issues related to the condition of the garments, such as shrinkage, the formation of holes, color change, and fabric mis-shaping.

In additional, attribute factors such as unsuitable design (e.g., fit, use properties) or mistaken purchases (e.g., wrong size) can lead to inactive use or never-use behaviors before disposal. (Klepp, 2001; Laitala & Boks, 2012).

Factors of clothing practice

Factors related to clothing practices, during the purchase, use, and disposal phases, play a significant role in sustainable clothing consumption behavior. These factors include the volume of clothing items, frequency of use, individual priorities, and situational influences.

The number of clothing items owned by consumers directly affects the duration of their usage and the frequency of wear before disposal (Hanson, 1980; Laitala & Klepp, 2020). The volume of clothing items is correlated with the frequency of garment usage for individuals, as a larger wardrobe is likely to result in less frequent utilization of each garment (Klepp et al., 2020). According to Laitala and Klepp (2020), passive use of clothing is strongly associated with consumers who emphasize brands and fashion, whereas active use of clothing is associated with purchasers of high-quality and value-for-money clothing.

Users' priorities in clothing acquisition, such as fashionable and sustainable production, significantly influence clothing consumption behavior (Laitala & Klepp, 2020). Specifically, individuals who prioritize that fabric quality tend to wear clothing more frequently compared to those who believe that fabric is not important (Laitala & Klepp, 2020). Moreover, consumers who exhibit a higher sensitivity to fashion trends, also known as fashion innovators, not only purchase more clothing but also allocate a greater amount of money towards their apparel choices in comparison to individuals who are less attuned to trends (non-innovators) (Lang et al., 2013; Rahman et al., 2020). Furthermore, consumers who place a greater emphasis on clothing quality are inclined to buy a larger number of clothing items (Lang et al., 2013). Additionally, the perceived level of environmental knowledge positively influences the purchase

intention for sustainable clothing (Rausch & Kopplin, 2021).

Situational factors, including social influence, situational events, time, and environmental resources, also influencing on clothing consumption behavior. Social influence plays a significant role in consumers' purchasing choices (Ciasullo et al., 2017). Situational events can prompt disposal-related decisions making (Hibbert et al., 2005; Jacoby et al., 1977). Events like clearing up (often connected to season changes), acquiring new clothing items, receiving requests from charitable organizations, identifying suitable recipients, moving, and bereavement are significant events leading to a substantial disposal of clothing items (Cluver, 2008; Collett et al., 2013; Hibbert et al., 2005; Laitala, 2014). The lack of visibility of inactive garments sometimes resulted in them being misplaced or overlooked (Smith, 2018). Individuals often take time to evaluate the potential use of a garment before deciding to dispose of it (Smith, 2018). Furthermore, the convenience of disposal options, such as trash, donation, or recycling activities plays a crucial role in consumers' decisions to dispose of clothing items (Birtwistle & Moore, 2007; Joung & Park-Poaps, 2013; Shim, 1995; Weber et al., 2017).

Additionally, practice factors such as weight management, investment value, sentimental value, and aesthetic object lead to inactive clothing use behaviors for clothing items that did not fit (Bye & McKinney, 2007). Individuals express a desire to preserve garments that hold emotional or sentimental value to them by repairing any damages, while easily disposing of other clothing items (Niinimäki & Armstrong, 2013). Moreover, boredom with the clothing in one's possession decrease the intention to retain it and increase the intention to dispose of it (Kwon et al., 2020).

Based on the current literature regarding sustainable clothing consumption behavior, most studies focus on an individual phase of clothing consumption and rely on consumers' estimations or assumptions derived from surveys. Few studies have specifically focused on the use phase of consumption, as its details are not as easily determined as in the purchase phase. Notably, apart from Gwozdz et al. (2017), there is a limited number of studies that explicitly categorize consumers based on clothing consumption during the purchase, use, and disposal phases, and propose intervention strategies by characterizing each category. A comprehensive list of studies mentioning these findings can be found in Table 1. In ***Study 1*** of this research, we aim to bridge these gaps by identifying factors across the purchase, use and disposal phases based on consumers' behavior and employing multiply data collection methods to explore the actual behaviors.

Table 1. Studies on sustainable clothing consumption behavior.

The phases on which studies focus	Data collection method	Consumer categorization (Yes/No)	Studies
Purchase, use/ maintenance and disposal	Surveys	Yes	Gwozdz et al. (2017)
	Surveys	No	Soyer and Dittrich (2021)
Purchase	Surveys	Yes	Jung and Jin (2016); Rahman et al. (2020)
	Surveys	No	Cham et al. (2018); Cho et al. (2015); Ciasullo et al. (2017); Lou and Cao (2018); Liang and Xu (2017); Kopplin and Rösch (2021); Rausch and Kopplin (2021); Xu et al. (2014)
Use/ maintenance and disposal	Wardrobe study and survey	No	Smith (2018)
Use/ maintenance	Integrated literature review	No	Aakko and Niinimäki (2021)
	Laundry diaries interview	No	Connor-Crabb & Rigby (2019)
	Case study	No	Fletcher (2012)
	Wardrobe survey	No	Klepp et al. (2020)
	Surveys	No	Wiedemann et al. (2020); Laitala and Klepp (2020); McQueen et al. (2022);
Disposal	Focus group and interview	No	Birtwistle and Moore (2007)
	Surveys	No	Bianchi and Birtwistle, (2010); Bianchi and Birtwistle, (2012); Degenstein et al. (2021); Fenitra et al. (2021); Joung and Park-Poaps (2013); Lang et al. (2013); Nenckova et al. (2020); Shim (1995); Weber et al. (2017); Zhang et al. (2020)
	Interview	No	Cruz-Cárdenas et al. (2016)
	Interview and survey	No	Cruz-Cárdenas et al. (2019); Hibbert et al. (2005); Kwon et al. (2020)
	Pre-experiment and survey	No	Degenstein et al. (2020)
	Literature review	No	Latitala (2014)
	Wardrobe Studies	No	Laitala et al., (2015)
	Essay writing	No	Lee et al. (2013)

2.2 Sustainable clothing disposal behavior change method

Behavioral change plays a crucial role in improving the implementation of evidence-based practice (Michie et al., 2011). In promoting sustainable clothing consumption

behavior, it is imperative to support behavior change through interventions (De Wagenaar et al., 2022). Studies conducted by De Wagenaar et al. (2022) and Zhang and Hale (2022) have explored the utilization of behavior change theory to promote clothing sustainability through practices such as repairing, and repurposing clothing.

According to Michie et al. (2014)'s framework for behavior change interventions, which is known as the behavior change wheel (BCW), there are three stages in the design process of behavior change interventions, as shown in Figure 6. The first stage, understanding behavior, includes four steps: (1) defining behavior issues, (2) selecting the target behavior, (3) specifying the target behavior, and (4) identifying what needs to change, which is the first stage toward changing behavior. These steps serve as the initial foundation for behavior change. The second stage, identifying intervention options, includes two steps: (5) identifying the intervention functions and (6) identifying the policy categories. The third stage, identifying content and implementation options, includes: (7) identifying behavior change techniques and (8) identifying the mode of delivery. Among these steps, (1) can be achieved by categorizing observed behaviors, (2) and (3) can be defined using literature, such as the symposium document discussed in sub-section 2.1.1, which can help determine "who should perform what, where, and when," (4) refers to why the target behavior is not currently being carried out, which can be examined qualitatively or quantitatively for the barrier and facilitator factors, (5–8) can be determined through the guidance of theorical frameworks step-by-step (Kolodko et al., 2021; Loft et al., 2017).

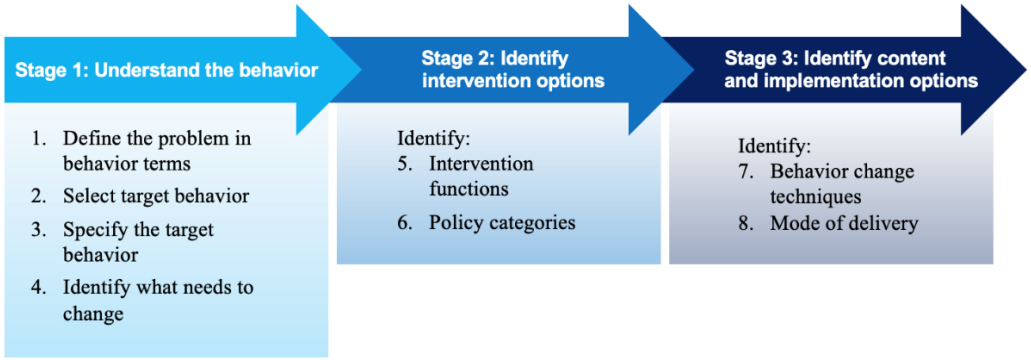

Figure 6. The design process of behavior change intervention (Michie et al., 2014).

In the context of clothing consumption, applying behavior change entails determining the following steps (French et al., 2012): (1) identifying what type of consumer needs to change what differently; (2) utilizing a theoretical frameworks to identify the barriers and facilitators of the target consumption behavior that need to be addressed, and (3) utilizing BCW guidance to determine effective intervention and implementation options to address modifiable barriers and enhance facilitators. Therefore, in order to provide interventions for sustainable clothing disposal behavior,

it is necessary to first understand clothing consumption behavior by categorizing behavior types and examining the issues need to be addressed across purchase, use and disposal phases among them. Subsequently, the main barriers and facilitators of the target disposal behavior within the target consumer category need to be identified within the domains of the theoretical framework. Lastly, intervention options that align with the identified barriers and facilitators can be determined, followed by the selection of implementation options based on these identified intervention options.

2.2.1 Overall of Behavior Change Wheel

The BCW is a widely used synthesis of theoretical frameworks in the field of behavior change interventions (Michie et al., 2014). Its frameworks provide a comprehensive approach to understanding and selecting behavior change options.

Developed by Michie et al. (2014), the BCW integrates a range of behavior change theories and models (see Figure 7). It consists of four layers: the Capability Opportunity Motivation–Behavior (COM-B) model, the Theoretical Domains Framework (TDF), intervention functions, and policy categories. The hub of the wheel is occupied by the COM-B model, surrounded by fourteen domains from the TDF in the second layer, followed by nine intervention functions in the third layer, and seven policy categories in the outer layer (Michie et al., 2014).

The COM-B model proposes that behavior is influenced by three components: capability, opportunity, and motivation (COM). Capability refers to the individual's psychological and physical capacity to engage in the behavior, opportunity relates to the external factors that enable or hinder the behavior, and motivation refers to the individual's conscious and unconscious processes that drive the behavior (Michie et al., 2011).

The TDF, complements the BCW by providing a set of theoretical domains that help identify barriers and facilitators to behavior change (Michie et al., 2014). It is an improved version of the COM-B model, an evidence-based theoretical model that highlights the dynamic interaction between capability, opportunity, and motivation influencing behavior (Weatherson et al., 2017). It consists of 14 domains that encompass various factors influencing behavior, including knowledge; skills; memory, attention and decision process; behavioral regulation, social/professional role and identity, beliefs about capabilities, optimism, beliefs about consequences, intentions, goals, reinforcement, emotion, environmental context and resources, and social influences (Michie et al., 2014). The TDF provides a comprehensive coverage of potential influences on behavior, delineates each influence through specific constructs

within each domain, and facilitates the connection between behavior change theories and techniques to address implementation challenges (Cane et al., 2015). Furthermore, it has demonstrated successful application in various settings for identifying influences on diverse behaviors (Atkins et al., 2017).

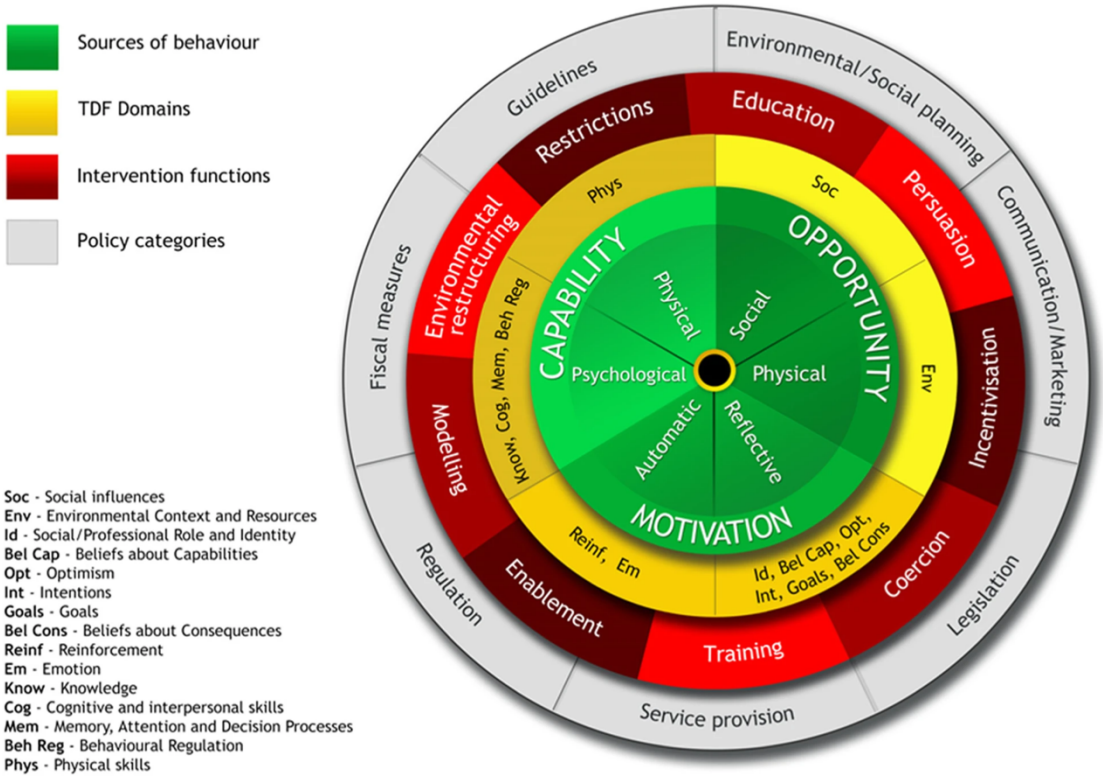

Figure 7. The Behavior Change Wheel.

The third layer of the BCW consists intervention functions, which provide nine effective interventions, while the fourth ring includes policy categories that suggest specific methods to implement interventions (Michie et al., 2014). These intervention options, as shown in Figure 7, play a crucial role in determining the most effective advice for behavior change (Aveyard & West, 2007). They are interlinked with the COM-B and TDF, providing intervention mapping for the target behavior identified in the first stage (understanding the behavior) of the behavior change intervention process (Michie et al., 2014). The outer layer, policy categories in the BCW framework, suggests the use of broader environmental and systemic changes to support behavior change. These categories include communication/marketing, fiscal measures, regulation, legislation, environmental/social planning, and service provision (Michie et al., 2014). Detailed description of the intervention options, including intervention functions and policy categories will be further discussed in subsection 2.2.2.

Furthermore, although the BCW framework itself may not explicitly include

implementation options such as behavior change techniques (BCTs) and mode of delivery, they are integral to the process of designing effective behavior change interventions (Michie et al., 2013). BCTs can be linked to the intervention functions, providing methods for specifying, evaluating, and implementing behavior change interventions (Michie et al., 2013). Modes of delivery encompass the various methods through which interventions can be delivered (Michie et al., 2014). Specific description of content and implementation options will be further discussed in subsection 2.2.3.

The APEASE criteria (affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety, equity) are recommended for making strategic judgements when selecting the most appropriate intervention and implementation options (Michie et al., 2014) (See Table 2). These criteria help ensure that the selected options are affordable, practical, effective, acceptable, safe, and equitable. However, the process of identifying and evaluating each option is complex. In this study, within the context of clothing disposal behavior, we conduct pre-evaluation using the APEASE criteria for simplification before identification, and post-evaluate candidate options using the APEASE criteria.

Table 2. A sample of APEASE criteria application (Michie et al., 2014).

Candidate intervention functions	**Does the option meet the APEASE (affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety, equity) criteria?**
Training	Practicable or not
Restriction	Acceptable or not
Modelling	Efficient or not
Environmental restructuring	Cost-effective or not

In this study, BCW-related frameworks are applied to investigate sustainable clothing disposal behavior among generation Y Chinese female consumers. They provide a structured approach for identifying intervention options and implementation options that can effectively promote behavior change. By incorporating the COM-B model, the main barriers and facilitators within the concise six components influencing clothing disposal behavior are identified. Employing TDF, themes concerning barriers and facilitators within the comprehensive-covered 14 TDF domains that influence clothing disposal behavior are identified and refined. Additionally, by aligning the identified domains with the main barriers and facilitators, suitable intervention and implementation options are sequentially pinpointed, aiming to promote sustainable clothing disposal behavior within this study.

However, it should be noted that the application of BCW-related frameworks

has primarily been implemented in the fields of implementation science and health, with limited studies employing them in the context of clothing consumption. When applied in this context, certain limitations arise due to potential construct overlap and a lack of specificity within the frameworks (Zhang & Hale, 2022), which could benefit from further specification.

2.2.2 Identifying barriers and facilitators influencing clothing disposal behavior using COM components and TDF domains

The COM-B model, employed by BCW as a foundational framework for understanding behavior within a given context, suggests that behavior can be influenced by capabilities, opportunities, and motivations (Michie et al., 2011; Michie et al., 2014). Each of these components can be divided heuristically into two types. Capability can be either physical (related to consumers have physical strength or skill) or psychological (concerning consumers' knowledge or psychological skills) to perform behaviors. Opportunity can be either physical (what the environment allows to facilitate in terms of resources, locations, physical barriers, etc.) or social (including interpersonal influences, social cues and culture norms). Motivation can be either reflective (including self-conscious planning and evaluations) or automatic (consumers' processes involving needs, desires, impulses, etc.) (Michie et al., 2011; Michie et al., 2014). This model provides a foundation for designing interventions aimed at changing behavior. When applied to intervention planning, it enables the identification of the primary components of capability, opportunity, and motivation (COM) within the behavior system that need to be changed (Michie et al., 2011).

The TDF is a theoretical framework that provides a comprehensive perspective on the cognitive, affective, social, and environmental influences on behavior (Atkins et al., 2017). It consists of 14 domains, including knowledge; skills; memory, attention and decision processes; regulation; social/professional role and identity; beliefs about capabilities; optimism; beliefs about consequences; intentions; goals; reinforcement; emotion; environmental context and resources; and social influences (Michie et al., 2014). There has been a growing recognition of the need to explicitly employ theory to identify facilitators and barriers that influence behavior change (Eccles et al., 2005; Foy et al., 2005). By utilizing the TDF, researchers to identify these facilitator and barrier factors provides valuable insights that guide the selection of appropriate intervention options (Zhang & Hale, 2022). Facilitator factors highlight the positive aspects that contribute to desired behavior, while barrier factors reveal the obstacles and challenges that impede behavior change (García de Jalón et al., 2015).

The application of the COM components and TDF domains, combined with the identification of facilitator and barrier factors, has been widely applied in assessing implementation issues and designing interventions to enhance evidence-based practice across various health settings (Francis et al., 2012; Michie et al., 2014). Additionally, within the field of environmental sustainability, researchers have explored the utility of the TDF in addressing implementation challenges and designing interventions by considering facilitator and barrier factors (Gainforth et al., 2016; Zhang & Hale, 2022). These studies demonstrate the versatility of identifying facilitator and barrier factors within the TDF framework, as they examine and improve behavior change efforts within the context of environmental sustainability. In the study by Zhang and Hale (2022), various barriers and facilitators related to knowledge of repair and repurposing, repair skills, time constraints, awareness of environmental impacts, and social support, and more were identified. Although the focus of this study is on repair behavior within the use phase of clothing mainly, it still provides valuable insights that can contribute to the identification of barriers and facilitators in clothing disposal behavior.

However, the domain of environment context and resources in TDF, encompass various factors such as item attributes, resource availability, salient event, time constraints, and resource convenience. Grouping these factors under a single domain may benefit from specifying them into "well-defined constructs" (Zhang & Hale, 2022). According to Jacoby's (1977) categorization of factors influencing disposal choices related to environmental context and resources, intrinsic product factors (e.g., clothing condition, price, etc.) and situational factors extrinsic to the product (e.g., storage space, events, etc.) are considered. To differentiate between resources for clothing disposal channels, resources for clothing storage, and situational factors related to events and time constraints, we further divide situational factors into those related to disposal channels, availability of wardrobe, and those related to events and time constraints. Consequently, the environmental context and resources domain in the TDF in this study is specified into categories of attributes of clothing items, situational factors related to disposal channels, availability of wardrobe and situational factors related to event and time constrains.

Therefore, to identify barriers and facilitators influencing clothing disposal behavior, this study employs both the COM components and TDF domains. Foundational constructive COM components are used to identify the main barriers and facilitators of clothing disposal behavior among generation Y Chinese female consumers. Comprehensive-covered TDF domains are employed to refine themes of barriers and facilitators of clothing disposal behavior among generation Y Chinese female consumers.

2.2.3 Intervention options: intervention functions and policy categories for promoting sustainable clothing disposal behavior

Within the framework of the BCW, intervention options, a systematic literature review of framework, are categorized into intervention functions and policy categories, provide a comprehensive set of strategies that can be employed to change behavior and support policy objectives (Michie et al., 2014). Content and implementation options, including BCTs and mode of delivery, allow practitioners to tailored intervention to the specific behavior, context, and target population, increasing the likelihood of successful behavior change outcomes (Michie et al., 2014; Michie et al., 2013; Sinnott et al., 2015).

Intervention functions

The intervention functions represent broad categories of means by which an intervention can change behavior (Michie et al., 2014). They include education, persuasion, incentivization, coercion, training, restriction, environmental restructuring, modeling, and enablement. Each function corresponds to distinct methods of influencing the COM components and TDF domains as shown in Appendix A (Michie et al., 2014). For instance, if the targeted behavior is related to physical opportunity (associated with the COM component) or environmental context and resources (associated with the TDF domain), the intervention functions of training, restriction, environmental restructuring, and enablement can be considered.

To simplify the identification process, pre-evaluation through APEASE criteria is employed. In this study, intervention functions of coercion, training, and restriction are excluded, as they are not practicable within the context of diverse voluntary clothing disposal behaviors. Subsequently, candidate intervention functions are identified, and the APEASE criteria are used for post-evaluation.

Policy categories

Policy categories refer to "the types of decisions made by authorities that help to support and enact the interventions" (French et al., 2012; Michie et al., 2014). They include communication/marketing, guidelines, fiscal measures, regulation, legislation, environmental/social planning, and service provision (Michie et al., 2014). The BCW suggests which policy categories are likely to be appropriate and effective in supporting each intervention function (Michie et al., 2014).

To simplify the identification process, pre-evaluation through APEASE criteria is employed. Policy categories of guidelines and legislation are excluded, as they are

not practicable within the context of diverse voluntary clothing disposal behaviors. Subsequently, candidate policy categories are identified, and the APEASE criteria are used for post-evaluation.

2.2.4 Implementation options: behavior change techniques (BCTs) and mode of delivery for promoting sustainable clothing disposal behavior

BCTs

BCTs, which refer to "an observable, replicable, and irreducible component of an intervention designed to alter or redirect causal processes that regulate behavior" (Michie et al., 2011; Michie et al., 2020). They are specific strategies or methods considered as the "active ingredients" in behavior change interventions (Michie et al., 2014). Examples of BCTs include goal setting, self-monitoring, feedback, social support, rewards, prompts/cues, and action planning (Michie et al., 2011; Michie et al., 2014; Michie et al., 2020). They are derived from the first consensus-based, cross-domain taxonomy of distinct BCTs known as BCT Taxonomy v1 (see Appendix B), which provides reliability data for the most/less frequent BCTs and is applicable across different behavior change frameworks (Michie et al., 2014; Michie et al., 2020; Michie et al., 2013). With 93 BCTs and their definitions included in the BCT Taxonomy, two methods are employed to narrow down the list. Firstly, the "BCTs used most/less frequently" are considered (See Appendix C), followed by exploring the less frequently used BCTs, mapping each intervention function in BCT Taxonomy v1 (Michie et al., 2014). Table 3 provides a sample of the most and less frequently used BCTs related to the education intervention function. Secondly, the process of selecting BCTs for the intervention involves understanding the behavior through the TDF and utilizing a matrix of domains and BCTs (Michie et al., 2008). This matrix, developed based on expert consensus, establishes the link between specific BCTs and TDF domains (Cane et al., 2015). Table 4 shows a sample of the link between BCTs and TDF domains.

In this study, we select BCTs by using "the most/less frequently used BCTs" list by consulting their definitions and examples in the BCTTv1 guidance. We also pre-evaluation using APEASE criteria. For example, BCT 5.3 "Information about social and environmental consequences" and BCT 5.1 "Information about health consequences" are suggested as the most frequently used BCTs within the education intervention function (Table 3). In accordance with the definition and examples from BCTTv1, BCT 5.3 was selected as the suitable candidate BCT in the context of clothing disposal, while BCT 5.1 was excluded due to its inapplicability. The selection

of potential BCTs is followed by post-evaluation using the APEASE criteria.

Table 3. A sample of most and less frequently used BCTs on the intervention function of education (Michie et al., 2014).

Intervention function	Individual BCTs
Education	Most frequently used BCTs • Information about social and environmental consequences • Information about health consequences • Feedback on behavior • Feedback on outcome(s) of the behavior • Prompts/cues • Self-monitoring of behavior Less frequently used BCTs • Biofeedback • Self-monitoring of outcome(s) of behavior • Cue signalling reward • Satiation • Information about antecedents • Re-attribution • Behavioral experiments • Information about emotional consequences • Information about others' approval

Table 4. A sample of the link between BCTs and TDF domains (Michie et al., 2014).

TDF Domain	BCT
Knowledge	Health consequences Biofeedback Antecedents Feedback on behavior
Skill	Graded tasks Behavioral rehearsal/ practice Habit reversal Body changes Habit formation
Beliefs about Capabilities	Verbal persuasion to boost self-efficacy Focus on past Success

Mode of delivery

The mode of delivery refers to the specific means through which the intervention is delivered to the target audience, considering the implementation context (Michie et al., 2014; Sinnott et al., 2015). As shown in Figure 8, it can take various forms, such as face-to-face sessions, digital platforms, or social media campaigns (Michie et al., 2014). Selecting the appropriate mode of delivery is essential for effectively reaching and engaging the target audience and maximizing the impact of the intervention. When identifying the mode of delivery, consideration should be given to the types of

BCTs that can be effectively implemented to bring about change (Michie et al., 2014).

Among the 8 primary delivery modes, including individual face-to-face, group face-to-face (human interaction), broadcast media, digital media (online media), outdoor media, print media, phone and individually assessed computer program, the delivery modes of human interaction, broadcast media, online media, outdoor media, and print media are included for identifying population-level clothing disposal behavior through pre-evaluation. The APEASE criteria are also used to post-evaluate the candidate modes of delivery.

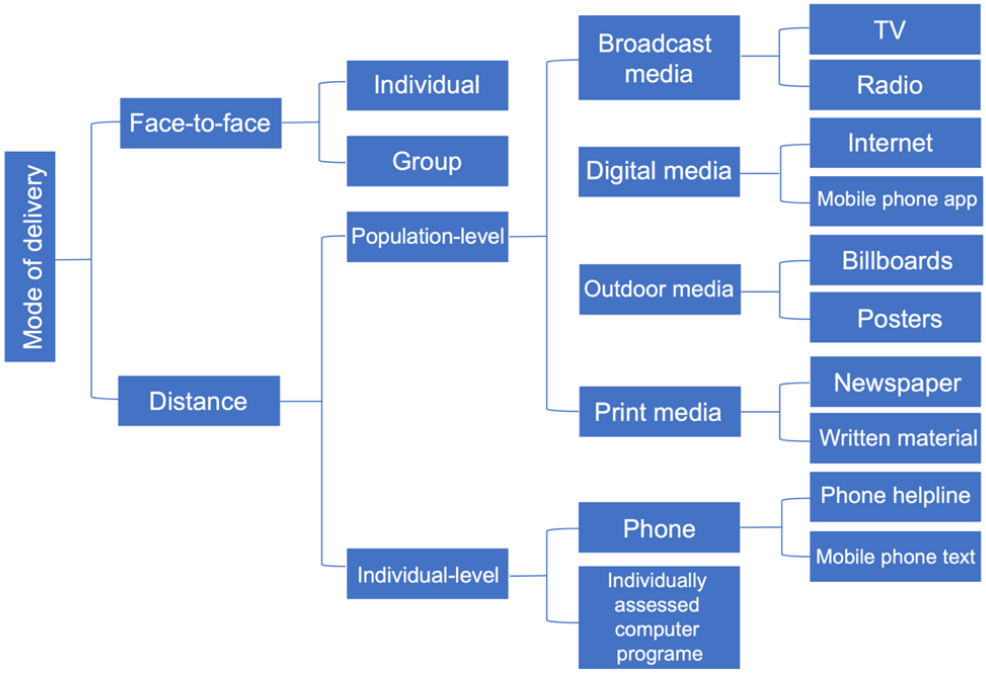

Figure 8. A simple taxonomy of modes of delivery.

2.2.5 Clothing disposal behavior in China

China has emerged as the world's largest exporter, producer, and consumer of textiles and clothing (Guan et al., 2019; Xu et al., 2022). However, the fast fashion culture and throwaway mentality in the country have resulted in discarded clothing becoming a significant form of solid waste, leading to negative environmental consequences and resource wastage (Birtwistle & Moore, 2007; Liang & Xu, 2017a). Compared to other countries such as Japan, the US, Germany, and the UK, clothing items are retained for a shorter duration in China (Laitala & Klepp, 2020). According to Liang and Xu (2017a), a considerable number of clothing items in China either accumulate in wardrobes or end up being discarded, ultimately finding their way into landfills. Alarming statistics reveal that approximately 26 million tons of used clothing are

dumped into landfills annually, and this figure is projected to rise to 50 million tons by 2030, with a recycling rate of less than 1% and minimal efforts for remanufacturing or harmless disposal (Xinhuanet, 2016). Moreover, as a significant global emitter of carbon dioxide, China faces the immense challenge of reaching its peak CO2 emissions by 2030 and achieving carbon neutrality by 2060 (Liu et al., 2022). Given that clothing disposal behavior plays a pivotal role in the overall clothing consumption cycle, effective measures are required to promote sustainable disposal practices in China (Zhang et al., 2020).

As most discarded clothes have the potential to be reused or recycled, China has made implemented various initiatives to establish recycling channels for consumers (Zhang et al., 2020). These channels include recycling containers set by local government agencies, non-profit organizations, recycling containers in the retail stores, online second-hand trading platforms, and online clothing recycling platforms (OCRPs).

Recycling containers set by local government agencies

Local government agencies, such as the municipality's Urban Management Bureau, and non-profit organizations like the Charity Association of China, initiate community-based clothing collection programs by installing recycling containers in residential communities, universities, and densely populated areas (see Figure 9a). Individuals can conveniently dispose of their unused clothing in these designated containers, which are regularly collected by authorized enterprises (Zhang et al., 2020). Additionally, in recent years, intelligent waste sorting recycling machines have been introduced in Shanghai, China with the support of local government agencies (see Figure 9b). These innovative machines enable the recycling of a wide range of items, including textiles, paper, metal, plastic, and glass. Local residents can easily participate in the recycling process by scanning codes with their mobile phones and are rewarded based on the weight of the items they recycle. Reports indicate that the implementation of these intelligent waste sorting recycling machines has led to a significant increase in the overall recovery rate of recyclable items (Xinmin News, 2022). According to the interview response of the study conducted by Guo and Kim (2021), the reuse and recycling methods of community textiles containers setting with government permission in Dalian, China include: (1) regeneration of industrial materials through crushing textiles, and (2) donation: aimed at poor areas and poor households; high-durability clothing is required.

(a) Community-based clothing recycling container from Dalian; (b) Intelligent waste sorting recycling machine from Shanghai

Figure 9. Recycling containers set by local government agencies.
Source: author's own photograph.

Non-profit organizations

Non-profit organizations such as the Red Cross Society of China, China Charity Federation, and China Environmental Protection Foundation occasionally organize charity donation events with diverse themes (Zhang et al., 2020). During these events, participants have the opportunity to contribute their gently used clothing through local logistics channels. The donated clothing is subsequently sterilized and distributed to impoverished areas, benefiting those in need.

Recycling containers in the retail stores

Retail stores such as UNIQLO, Zara and H&M have established take-back programs that accept waste clothing from consumers, regardless of the brand (Spuijbroek, 2019; Zhang et al., 2020) (see Figure 10). Consumers can conveniently drop off their unwanted clothing items at the designated local stores (Spuijbroek, 2019; Zhang et al., 2020). Some stores, such as H&M, even offer incentives such as coupons for further purchases (Youell, 2013). Zara introduced a home pick-up service in China in 2018, allowing customers in Shanghai and Beijing to request free clothing collection when placing orders through Zara's website, eliminating the need to visit a physical store for donations (Inside Retail Asia, 2018). The logistics for these collection programs is managed by cooperative delivery service companies, and the donated clothing is distributed to those in need or undergoes recycling processes. Notably, the availability of such services is currently limited in China, and most participating brands are not of Chinese origin (Guo & Kim, 2021).

Figure 10. UNIQLO recycling container in China.
Source: author's own photograph.

Online second-hand trading platforms

Consumers have the option to sell their unwanted clothing items through online second-hand trading platforms like Idle Fish (Yao & Miao, 2021; Zhang et al., 2020). However, the second-hand clothing industry in China remains largely unexplored and overlooked (Liang & Xu, 2017a), with a limited number of second-hand clothing retailers available (Xu et al., 2014). This can be attributed, in part, to factors such as the affordability of new clothing items (Baden & Barber, 2005; Xu et al., 2014), concerns about face-saving related to perceived financial inferiority of using second-hand products (Wenger, 1998), and the absence of a national system to facilitate the collection of used clothing items from consumers (Hawley, 2000).

OCRPs

An OCRP has emerged in China, providing online booking and offline free door-to-door pick-up services (Spuijbroek, 2019; Zhang et al., 2020). As a promising clothing recycling platform, after disinfecting and sorting, the OCRP disposes the clothing through reuse and recycling methods according to the condition of the collected clothing. These methods include: 1) regeneration of agricultural thermal insulation materials and industrial sound insulation materials; 2) donation to regions in need within China, where almost new clothing, especially winter clothing, is required; 3) exporting to Africa and some southeast Asian countries, where high-

quality, bright-colored summer clothing is required; and 4) transformation into clean energy (Guo & Kim, 2021). However, despite its potential effectiveness and professionalism could help consumers appropriately dispose of clothing, OCRP has not gained widespread acceptance among consumers in China (Zhang et al., 2020).

Therefore, based on the current disposal status, it is crucial to propose relevant intervention to promote clothing disposal behavior by in China.

2.3 Summary

This chapter begins with a review of the sustainable clothing consumption and the factors related to it, specifically focusing on the purchase, use and disposal phases. It provides an overview of the target behaviors that promote sustainable consumption and highlights the key issues in clothing consumption that need to be addressed based on existing literature. While previous studies have primarily focused on the purchase and disposal phases, there is a noticeable research gap regarding the use phase of clothing consumption. Studies that focus on the use and maintenance phases tend to investigate maintenance practices, such as washing and drying. Additionally, few study have proposed intervention directions based on consumer categorization. Furthermore, previous research has heavily relied on respondents' estimations and retrospection through surveys, indicating a need for observing the actual behavior of consumers over a designated time period. Therefore, it is a crucial to identify consumer categories based on their actual clothing consumption behavior throughout purchase, use and disposal phases, and identify consumption issues by characterizing each category. In this study, we aim to fulfill this requirement by categorizing consumers' behavior throughout the actual use behavior and conducting a comprehensive examination of the entire consumption phases through a wardrobe study in ***Study 1***. This will enable us to identify factors related to sustainable clothing consumption. By combining the factors of clothing inflow and outflow based on each category, a comprehensive understanding of clothing consumption can be obtained.

The chapter then introduces the relevant theoretical frameworks for BCW. It highlights the significance of behavior change in promoting sustainable clothing disposal and emphasizes the practical application of the BCW-related frameworks in intervention design steps. It notes the limitations of applying TDF domains to clothing disposal behavior. By considering factors that influence disposal choices, it further refines the TDF's environment context and resources domain into sub-domains: attributes of clothing items, situational factors related to disposal channels, availability of wardrobe, and situational factors related to events and time constraints

within the context of clothing disposal behavior. The review also delves into the identification barrier and facilitator factors regarding behavior issues within COM components and TDF domains, as well as the identification of intervention functions, policy categories, BCTs, and mode of delivery within the BCW frameworks. Furthermore, to simplify the intervention and implementation options identification, pre-evaluation using APEASE criteria is performed. As shown in Table 5, following BCW guidance, there are initially 9 intervention function options, 43 possible combinations between intervention function and policy category, 149 possible combinations between intervention function and BCTs, and 1192 possible combinations between BCTs and mode of delivery. However, this procedure shows complex. Pre-evaluation using APEASE criteria in the context of clothing disposal in ***Study 2*** simplifies this to 6 intervention function options, 19 intervention function and policy category combinations, 12 intervention function and BCTs combinations, and 60 BCTs and mode of delivery combinations.

Table 5. Comparison between general procedure using BCW frameworks and procedure in *Study 2*.

	Intervention functions (IF)	**Policy categories (PC)**	**BCTs**	**Modes of delivery (MD)**
General procedure	9 IF options	43 possible combinations between 9 IF options and 7 PC options	149 possible BCT combinations between 8 IF options (No BCTs are linked to IF option of "Restriction") and 93 BCTs	1192 possible combinations between 149 possible BCT combinations and 8 MD options
Procedure in Study 2 (After pre-evaluation through APEASE)	6 IF options	19 possible combinations between 6 IF options and 5 PC options	12 possible BCT combinations between 7 IF options (The excluded IF options included "Restriction") and 8 BCTs	60 possible combinations between 12 BCT combinations and 5 MD options

However, it's worth noting that these frameworks have primarily been implemented in the fields of implementation science and health, with limited studies employing them in the context of clothing consumption. To address this gap, ***Study 2*** of this research will conduct a case study and develop a procedural method for promoting sustainable clothing disposal behavior among generation Y Chinese female consumers based on the categorization of behavioral issues identified in ***Study 1***.

Finally, the chapter provides a summary of clothing disposal behavior in China. It outlines the challenges faced by China in terms of clothing disposal and lists the

efforts that the country has made, along with various disposal methods and potential issues. Limited studies have focus on clothing disposal behavior in China, and previous studies primarily examined disposal reasons, destinations, and attitudes based on respondents' estimations regarding clothing items that have already been designated for disposal, neglecting those in passive wear and potentially on the verge of being disposed of. Therefore, in ***Study 2***, we aim to explore the clothing disposal behavior by examining items both designated for disposal and under-disposal, based on the categories and disposal issues identified in ***Study 1*** among Chinese consumers, guided by theorical frameworks. This will provide further insights into sustainable clothing consumption patterns.

Chapter 3. Methodology

This chapter provides a comprehensive explanation of the research methodology employed in the dissertation, including the research design and main research procedures. It begins by outlining the key research procedures adopted for this study based on research objectives. Subsequently, it delves into the quantitative research method used in ***Study 1***, which encompasses data collection through a wardrobe study, data measurement, and quantitative analysis. Finally, it presents the combination of qualitative and quantitative research method for ***Study 2*** (case study), which involves data collection through semi-structured individual interviews, data coding, thematic and statistical analysis.

3.1 A summary of research design

The main research objective **(MRO)** of this thesis is to propose a procedural method that promote sustainable disposal behavior in China.

To achieve ***MRO***, this research is structured by two sub-objectives, as depicted in Figure 1. The first sub-objective ***(SRO1)*** aims to identify the clothing consumption issues that need to be addressed through examining the factors related to sustainable clothing consumption based on the categorization of Chinese consumers' behavior. The second sub-objective ***(SRO2)*** focuses on developing a procedural method for promoting sustainable clothing disposal behavior among generation Y Chinese female consumers based on the identified categorization of behavioral issues. There is a strong relationship between ***SRO1*** and ***SRO2***, as achieving ***SRO2*** will require a thorough understanding of clothing consumption behaviors with the identifications of areas that require change based on specific consumer categories. Fulfilling ***SRO1*** will involve identifying main barriers and facilitators related to behavioral issues and enacting a series of intervention and implementation options within theoretical frameworks through a case study. Ultimately, successfully achieving these two sub-objectives will fulfill the ***MRO***.

Accordingly, two major studies were conducted to achieve ***SRO1*** and ***SRO2***. To achieve ***SRO1***, ***Study 1*** presents the categorization of Chinese consumers and factors related to the clothing consumption behavior while identifying the environmental issues that need to be addressed in current clothing consumption behavior. Initially, a matrix approach was employed to categorize clothing consumption behavior based on the actual total clothing items (TCI) and number of

average wears of each item (NAWEI) which reflects wearing frequency, observed through 60 participants in the wardrobe study. Following the observations, wardrobe surveys were administered to participants afterwards, questionnaires consisting of general questions on demographics and habitual behavior, as well as designated questions regarding garment attributes of the high-frequently used items captured from observation phase. These surveys aimed to explore potential factors influencing differences in behavior categories. Statistical tests, such as Chi-square, Fisher's exact test, and variance analysis, were conducted to compare variables related to clothing consumption behavior across the purchase, use, and disposal phases. Through this comprehensive analysis, the factors associated with sustainable clothing consumption behavior among Chinese consumers were identified, shedding light on the environmental issues that need to be addressed.

To achieve ***SRO2***, ***Study 2*** focuses on two specific disposal issues identified in ***Study 1*** as a case study. ***Study 2*** initially examines the main barriers and facilitators of sustainable clothing disposal behavior for the targeted issues. Semi-structured individual interviews were conducted with 16 female consumers of generation Y to identify these barriers and facilitators. Qualitative thematic analysis was employed to inductively generate themes after coding, which were then organized deductively using TDF domains and COM components. For the main barriers and facilitators associated with the target issues within COM components, a quantitative approach was used, including a quantitative data analysis for comparing the involved components. Moreover, the themes corresponding to the primary barriers and facilitators within TDF domains were further refinement, incorporating insights derived from pertinent literature and the specific context of clothing disposal. Furthermore, intervention functions were identified by mapping the main barriers and facilitators within TDF using linkage matrices within the BCW framework. Policy categories were identified by mapping the identified intervention functions using linkage matrices within the BCW framework. BCTs were selected from the "most/less frequently used BCTs" list (See Appendix C) and were consulted along with their definitions and examples through Behavior Change Technique Taxonomy v1 (BCTTv1) (See Appendix B) provided by Michie et al. (2014), and the mode of delivery was identified from the taxonomy provided by Michie et al. (2014). Each intervention or implementation option was pre- and post-evaluated according to the APEASE criteria, which include affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety, and equity, as part of the BCW approach.

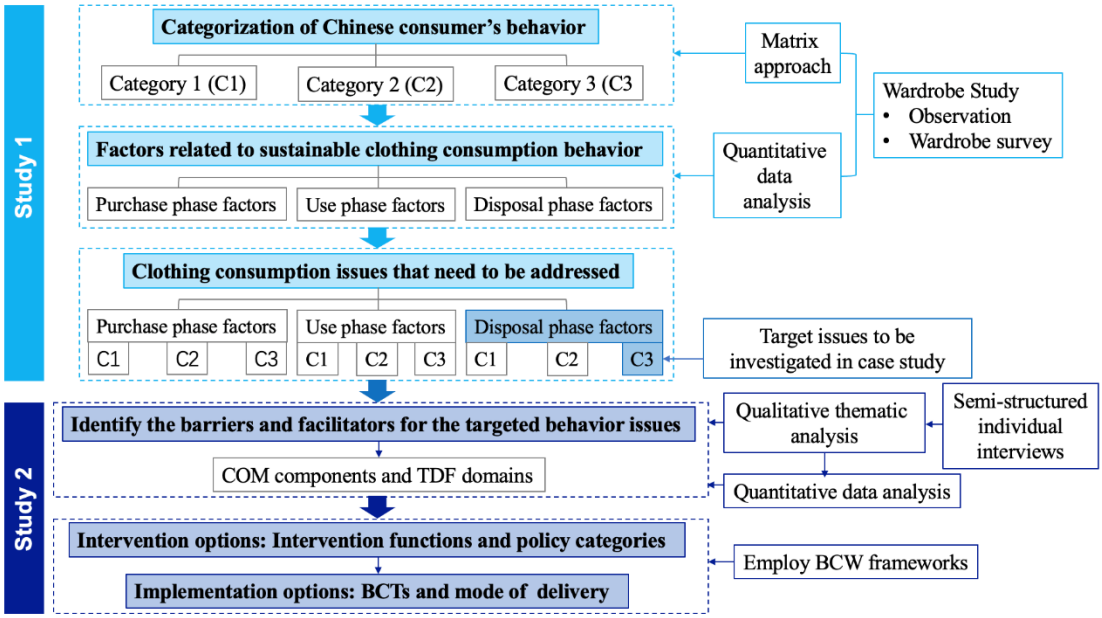

Figure 11. Research design outline.

3.2 Study 1: Sampling data collection and analysis

The literature provides a theoretical basis for the data collection. As a means of investigating actual clothing consumption behaviors and categorizing them, the data of total clothing items (TCI) (including tops, outerwear, and bottoms) and usage frequency: number of average wears of each item (NAWEI) as two major use behaviors were collected through observation. A matrix was then used to categorize consumption behavior based on the TCI and wearing frequency that have been used and unused for 30 days. For clarity, the total number of clothing items used is referred to in this study as TCI-1, whereas the total number of unused clothing items is referred to as TCI-2. In TCI-1, the clothing items worn with the highest frequency were designated as representative objectives to explore garment attributes (purchase time, price, brand level, garment type, and fiber content). Furthermore, to identify the factors that influence different types of consumption behavior, the variables of the purchase, use, and disposal behavior phases were measured between the behavior categories.

3.2.1 An overview of *Study 1*

Study 1 aims to address ***SRO1***, which involves identifying the clothing consumption issues that need to be addressed through examining the factors related to sustainable clothing consumption based on the categorization of Chinese consumers' behavior. Specifically, the study aims to answer two sub-questions: (1) how can we categorize

clothing consumption behaviors? and (2) what factors influence different types of clothing consumption behaviors? To achieve this, a two-phase wardrobe study was conducted to collect data, incorporating observation and a wardrobe survey to collect relevant data.

The wardrobe study, also known as a wardrobe audit (Klepp et al., 2020), is a methodological approach that examines the relationship between clothing items within an individual's wardrobe by registering and analyzing the garments owned by individuals (Klepp & Bjerck, 2014; Klepp et al., 2020; Laitala & Klepp, 2011). Wardrobe studies are particularly relevant in understanding how clothing usage patterns and their interdependencies impact the environment (Klepp & Bjerck, 2014). They have been developed as a method for gathering knowledge about clothing usage, which is valuable in discussions regarding environmental sustainability (Klepp et al., 2020). Conducting a wardrobe study provides valuable insights into how clothing items are used and the reasons behind these usage patterns. It helps in developing a better understanding of the material aspects involved in everyday clothing using practices (Klepp & Bjerck, 2014; Smith, 2018).

The observation study, as a methodology employed in consumer behavior research, involved the direct observation of individuals in natural settings, enabling the collection of real-time data on various aspects of clothing-related activities, decision-making processes, and social interactions (Davis, 1987; Merriam & Tisdell, 1998). In conjunction with interviews or questionnaires, the observation study provided valuable preliminary information about participants' external behaviors. This initial data guided subsequent inquiries into participants' inner values and beliefs (Cowie, 2009). By directly observing participants in their natural environments, the observation study aimed to capture authentic data, avoiding potential biases that may arise from self-reporting or retrospective accounts. This approach facilitated the collection of real-time information, providing a more accurate depiction of participants' clothing-related behaviors.

The wardrobe survey is a research method that combines elements of both a traditional survey and a wardrobe study, building upon the foundation of the wardrobe study that examines individual garments and their specific characteristics (Klepp et al., 2020). This hybrid approach incorporates quantitative analysis and enables researchers to collect data on a larger scale while still capturing important details about clothing items and their usage patterns (Klepp et al., 2020; Laitala & Klepp, 2020). This hybrid approach allows researchers to collect data on a larger scale while still capturing important details about clothing items and their usage patterns (Klepp et al., 2020). By utilizing the wardrobe survey, valuable quantitative insights into the

relationships between individuals and their clothing can be obtained, enabling a more comprehensive understanding of clothing consumption behaviors.

In this wardrobe study, the observation phase addressed the records of the 30-day TCI and NAWEI for the participants through daily photograph logs (and record forms). The wardrobe survey phase focused on demographic information, purchase behavior, disposal behavior, and use behavior with designated clothing items, the items worn with the highest frequency (IWHF), generated from the observation phase. Figure 12 shows the structure of the method of the wardrobe study.

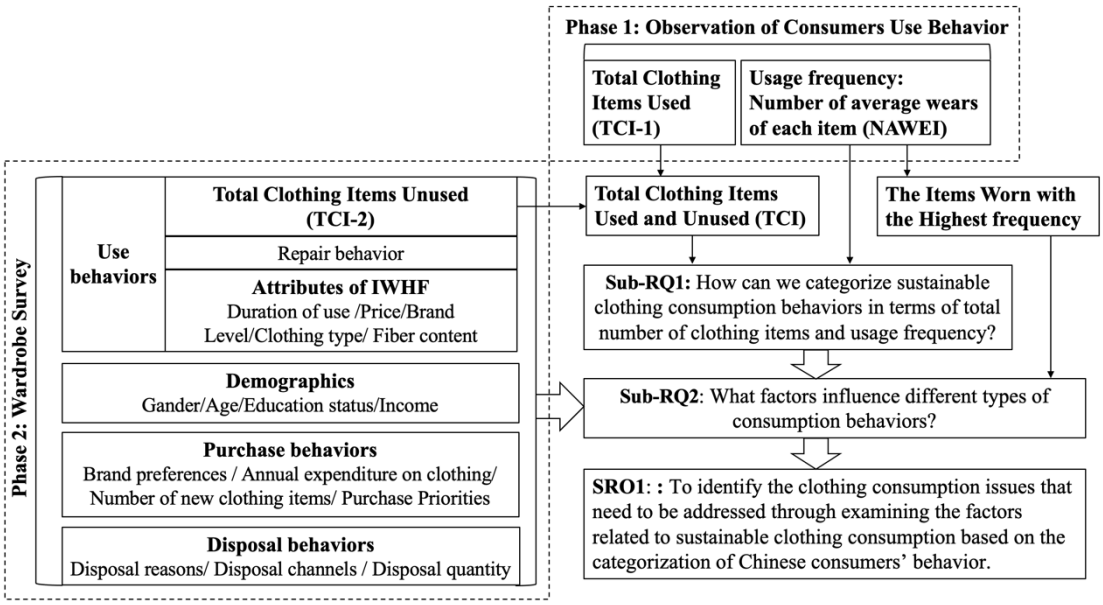

Figure 12. Structure of the method.

3.2.2 Determination of samples

An observational study was conducted to obtain data on consumers' actual usage behaviors. A total of 60 participants were recruited through a snowball sample for this study, making use of friends, colleagues, and family connections for initial contacts. As a non-probability sampling method, snowball sampling can access hard-to-reach and diverse populations and increases the possibility of selection diversity in terms of age and background among participants (Perez et al., 2013). In this study, the sample size (N = 60) is suitable according to Saunders et al. (Saunders et al., 2012), who recommended a minimum sample size of 30 samples for non-probability sampling in populations with multiple characteristics. The sample selection criteria included age (between 18 and 70 years) and urban settlement in Liaoning province, China. Individuals who mainly wore uniforms were excluded from the study because their clothing use behaviors were less varied and less relevant to the study's focus.

3.2.3 Data collection (phase 1): Observation

The observational study was conducted between October 2021 and November 2021, which was a typical autumn in Liaoning province (the temperature ranged from about 5 to 20 degrees Celsius). Thus, clothing items for the season were more clearly defined and included tops (T-shirt, shirt, hoodie, etc.; dresses were classified as tops to reduce the complexity of information collection), outerwear (jacket, suit, coat, etc.), and bottoms or skirts). We recorded what participants wore to go out for 30 consecutive days during the study period, and the days they spent at home were ignored, as home clothes were excluded from study. Participants were instructed to dress naturally according to their personal habits, and record their daily three-item wear (accessories and underwear were excluded) through photograph logs or by filling out and coding the forms that we provided (See appendix D). Photographs (see Figure 13) were collected online daily during the study period, and items that were not clear were immediately confirmed with the participants. For those participants who were unable to take photos, the provided forms were collected after recording. Participants were directed by the author to provide descriptions of the clothing items to fill out the form. Therefore, the data of the TCI-1 (the total quantity of tops, the total quantity of outerwear, and the total quantity of bottoms), NAWEI, and wears of the highest-frequency items (WHFI), which include the wears of the highest-frequency tops, highest-frequency outerwear, and highest-frequency bottoms were collected by counting manually. For instance, when a participant wears a jacket seven times in 30 days, and this jacket is worn more frequently than any other outerwear he/she wears in this time period, the jacket is counted as one in TCI-1, and seven in the outerwear of WHFI. Participants were also informed that their responses would be used in the research, and that they could withdraw their individual data from the study at any time.

Figure 13. Daily photograph log samples collected from participants.

3.2.4 Data collection (phase 2): Wardrobe survey

A wardrobe survey was administered to participants after the observation phase, utilizing questionnaires that included both general and designated questions. These questions aimed to explore potential factors that influence the differences in use behavior categories. The general questions included demographics (Table 6), the TCI-2 (including tops, outerwear, and bottoms) over a period of 30 days, repair experience, purchase behavior (such as brand preference, annual expenditure on clothing, number of new items, and purchase priorities) (De Wagenaar et al., 2022), and disposal behavior (disposal reasons, disposal channels, and yearly disposal quantity).

Based on the results of their TCI-1, participants were then asked to count the number of unused clothing items (TCI-2), including tops, outerwear, and bottoms, for the current season. Designated questions for each participant focused on the attributes of the IWHF, which included duration of use, price, brand level, clothing type, and fiber content for the three items (top, outerwear, and bottom) worn most frequently. After being informed of their IWHF derived from the observation reports, participants were asked to answer questions related to the garment attributes of the three IWHF items during the past 30 days. Due to the COVID-19 pandemic, the researcher was unable to identify specific clothing attributes, especially brand level and fiber content, in person. Therefore, participants were asked to provide the brand names of the designated clothing items, and the brand level was subsequently determined by the researcher. Additionally, participants were suggested to refer to the laundry label of the clothing items for information on fiber content. Any responses that conflicted with the photographs were reconfirmed with the participants. The detailed content of the

questionnaire provided in Appendix E.

As shown in Table 6, among the 60 participants, 67% were female and 33% were male; 33% were 38–47 years, 23% were 28–37 years old, 17% were 18–27 years, 15% were older than 58 years, and 12% were 48–57 years. In terms of education level, most of the participants had a bachelor's degree (42%), 31% had a master's degree or above, and the remaining 27% had a college education level or lower. In terms of income, 58% had medium-level incomes, 23% had low-level incomes, and 19% had high-level incomes.

Table 6. Demographics of participants

		Count	Percent
Number of participants	N	60	100%
Gender distribution	Men	20	33%
	Women	40	67%
Age group	18–27 years	10	17%
	28–37 years	14	23%
	38–47 years	20	33%
	48–57 years	7	12%
	58 years and above	9	15%
Education status	College and below	16	27%
	Undergraduate	25	42%
	Master and above	19	31%
Income level	Low level	14	23%
	Medium level	35	58%
	High level	11	19%

3.2.5 Measurement

We developed survey items based on a literature review. The question items describing garment attributes and consumption behavior across the phases of purchase, use, and disposal were adapted from the items in the questionnaires used by Gwozdz et al. (2017) and Laitala and Klepp (2020). To ensure full understanding, a pilot study tested all survey items prior to implementation. As shown in Table 7, among the three consumption phases, purchase behavior was measured based on four variables (variables 1–4): brand preference, annual clothing expenditure, number of new items, and purchase priority. Disposal behavior was measured based on three variables (variables 5–7): disposal reasons, channels, and annual disposal quantity. Apart from TCI and usage frequency, use behavior focused on seven variables (variables 8–14):

repair/repurpose experience, TCI-2, and garment attributes of the designated clothing items (top, outerwear, and bottom of the IWHF), including duration of use, price, brand level, garment type and fiber content. We chose the IWHF to determine the relationship between high-frequency usage and garment attributes for each category. In Table 7, all the predicted variables related to clothing consumption across the three phases are listed along with their corresponding answer categories.

Table 7. Consumption phases measurements

Phase	Question items	Answer categories
Purchase Behavior	1. Brand preferences category	Budget brands (e.g., H&M or Uniqlo); Casual/middle brands (e.g., Levi's, MLB or FILA); Premium brands (e.g., Louis Vuitton, Prada or Moschino).
	2. Annual clothing expenditure (RMB)	2000 and below, 2001–5000, 5001–10000, 10001–20000, 20001 and above.
	3. Number of new items	5 items and less, 6–20 items, 21–40 items, 41 items or more.
	4. Purchase priorities	Fashion/trendy, price, fabric quality, aesthetics (e.g., design or style), sustainable/environmentally production and brand.
Disposal Behavior	5. Disposal reasons	Wear and tear, fashion issues, poor fit, wardrobe space, others.
	6. Disposal channels	Conventional reuse and recycle channels, OCRP, throw away.
	7. Disposal quantity this year	Fewer than 10 items, 11–20 items, 21–30 items, 31 items and more.
Use Behavior with Garment Attributes of IWHF	8. Repair/repurpose experience	Has repair or repurpose clothing experience last 12 months (0 = no, 1 = yes).
	9. TCI-2	Varied from 4 to 62.
	10. Duration of use	Less than 1 year, 1–2 years, 2–3 years, more than 3 years.
	11. Price (RMB)	200 and below, 201–500, 501–1000, 1001–2000, 2001and above.
	12. Brand Level	Budget brands (e.g., H&M or Uniqlo); Casual/middle brands (e.g., Levi's, MLB or FILA); Premium brands (e.g., Louis Vuitton, Prada or Moschino).
	13. Garment type	Top: t-shirts/polos/singlets, shirts/blouses, blazers/hoodies, others; outerwear: jackets, suits, overcoats, parkas, others; bottoms: jeans, sports /knitted trousers, formal trousers, skirt, others.
	14. Fiber content	Cotton and cotton blends, wool and wool blends, synthetics, others.

3.2.6 Data analysis

The analysis was conducted using IBM SPSS Statistics (version 28). Chi-square tests, Fisher's exact tests, and variance analyses were performed. All tests of statistical significance were two-sided, and statistical significance was accepted at $p \leq 0.05$. Frequencies and percentages were calculated and compared using Pearson's chi-square and Fisher's exact tests for count data. The chi-square partitioning method was applied to determine the pairwise comparison of groups. One-way ANOVA with a Bonferroni Correction for pairwise group comparison was used to determine the differences among categories for numerical data.

3.3 Study 2: Sampling data collection and analysis

3.3.1 An overview of *Study 2*

The purpose of this case study is to develop a procedural method for promoting sustainable clothing disposal behavior among generation Y Chinese female consumers based on the identified categorization of behavioral issues identified in ***Study 1*** (***SRO2***). Specifically, for the category of large-passive (L-P), two disposal issues need to be addressed: (1) improving the disposal quantity of unused clothing items (TCI-2), and (2) promoting the usage of the OCRP.

Participants belonging to the L-P own a significant number of clothing items, including a substantial quantity of used clothing items (TCI-1) and TCI-2. While they contributed more to the overall disposal quantity, the large number of TCI-2 indicates a considerable amount of clothing items with disposable potential that have not been properly disposed of, leading to a shortened lifespan of clothing (Laitala & Klepp, 2015). Additionally, the lack of usage of the OCRP, which emerged as a new channel for disposing of unwanted clothing, indicates the need for interventions in China to enhance user awareness and experience, as well as to integrate and optimize the disposal resources (Zhang et al., 2020).

To address ***SRO2***, ***Study 2*** aims to answer four sub-questions: (1) Using the COM and TDF, what are the main barriers and facilitators to clothing disposal for unused clothing items? (2) Using the COM and TDF, what are the main barriers and facilitators to the usage of OCRP for disposing of unused clothing items? (3) How to suggest intervention and implementation options for promoting the disposal for unused clothing items? (4) How to suggest intervention and implementation options for promoting the usage of OCRP?

Chinese female consumers from Generation Y were selected as the target participants since the L-P with disposal issues identified in ***Study 1*** mainly comprises female consumers, with the majority falling within the 28-47 age range (75%), aligning with Generation Y. Since women are primarily responsible for clothing disposal in households (Cruz-Cárdenas et al., 2019), it is appropriate to focus on women's clothing disposal behavior in this study. Furthermore, Generation Y consumers, particularly in China, have a significant influence on the consumption of clothing products due to their higher discretionary income (Tee et al., 2013).

According to the design and procedure guided by the BCW steps, COM-B and TDF-based implementation research steps (Atkins et al., 2017; Michie et al., 2014), the behavior change process guided by BCW-related frameworks consists several steps, beginning with the identification and definition of the target behavior and what needs to change. Subsequently, intervention functions and policies are selected to facilitate the desired change. Finally, the appropriate BCTs and mode of delivery are determined for implementing the intervention (Michie et al., 2014).

In this study, it employed a combination of qualitative and quantitative approach. Based on the target behavior issues, to identify what needs to change, the COM and TDF approaches are employed. Qualitative thematic analysis was employed to inductively generate themes after coding, which were then organized deductively using TDF domains and COM components. For the main barriers and facilitators associated with the target issues within COM components, a quantitative approach was used, including a quantitative data analysis for comparing the involved components. Moreover, the themes corresponding to the primary barriers and facilitators within TDF domains were further refinement, incorporating insights derived from pertinent literature and the specific context of clothing disposal. Subsequently, for, intervention options, intervention functions were identified by mapping the main barriers and facilitators within TDF using linkage matrices within the BCW framework. Policy categories were identified by mapping the identified intervention functions using linkage matrices within the BCW framework. For implementation options, BCTs were selected from the "most/less frequently used BCTs" list (See Appendix C) and Behavior Change Technique Taxonomy v1 (BCTTv1) (See Appendix B) provided by Michie et al. (2014), and the mode of delivery was identified from the taxonomy provided by Michie et al. (2014). Each intervention or implementation option was pre- and post-evaluated according to the APEASE criteria. Figure 14 provides an illustration of the design process in ***Study 2***.

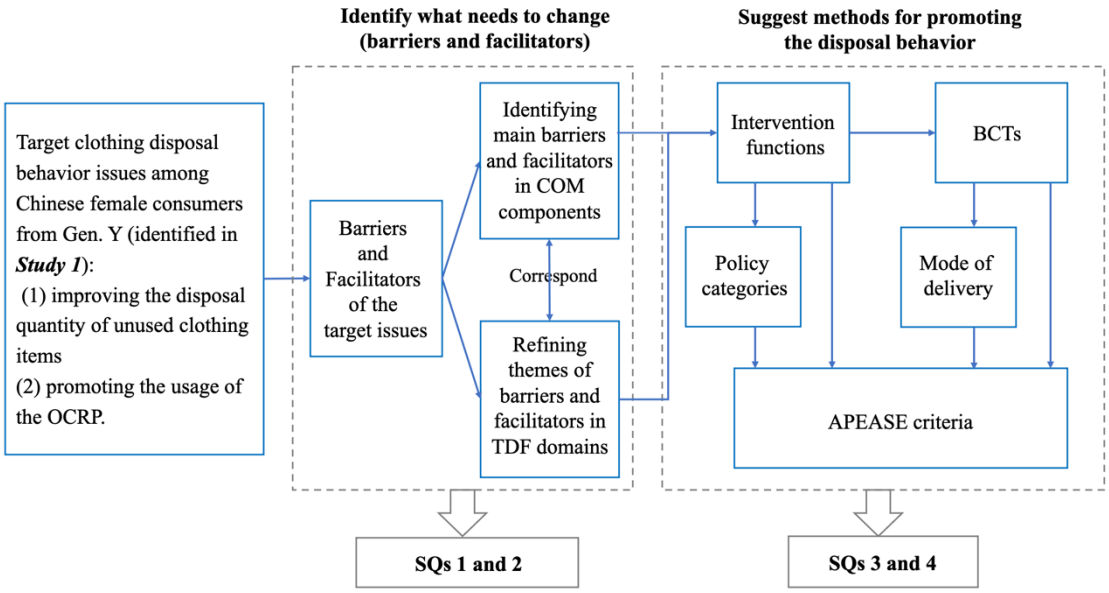

Figure 14. Design process in *Study 2* using BCW (Michie et al., 2014).

3.3.2 Recruitment of participants

Participants in this study comprised 16 Chinese female consumers from Generation Y. Based on the recommendation by previous study, a minimum of 10 interviews were conducted initially for the initial data analysis (Francis et al., 2010). Subsequently, an additional three interviews were conducted, and no new themes emerged, indicating saturation. Hence, a total of 16 participants were included in this study (without new themes emerged among the last 3 interviews), aligning with the recommended sample size.

Participants were recruited through snowball sampling for this study, utilizing friends and colleagues as initial contacts. The inclusion criteria were being aged between 28 and 43 years and residing in urban of China. Snowball sampling provided the opportunity to recruit diverse participants (Perez et al., 2013). Participants who accepted our invitation suggested their friends or colleagues who might be interested in participating.

3.3.3 Data collection: A semi-structured individual interview

A total of 16 participants were engaged in semi-structured individual interviews. Prior to the interviews, participants were informed about the study's purpose and provided their consent to have the interviews audio-recorded. The interviews were conducted by one researcher between March and May 2023. The choice of interview location was determined by the participants' preferences and the geographical distance

involved. Consequently, face-to-face interviews were conducted in various settings, such as participants' homes, workplaces, or cafes, while some interviews were conducted via telephone. To ensure effective communication and minimize language barriers, the interviews were conducted in the native language of the interviewees, which is Chinese. Each interview had an approximately duration of 20 minutes and was audio-recorded for accurate transcription. Approximately 51,200 English words were transcribed after translation.

Before the interviews, participants were instructed to check their wardrobes, including counting the number of unused clothing items they had accumulated during the current year, and categorizing them based on the reasons for not wearing them. Additionally, they were asked to recall the number of clothing items they had disposed of in the last year, categorize them based on the reasons for disposal, and provide information about the disposal channels they had used throughout the year. The scope of unused clothing items encompassed tops, bottoms, outerwear, bags, and shoes, while excluding underwear and other accessories such as scarves and hats. This approach enabled the interview questions to focus on the participants' unused clothing items, the items they had disposed of, and the disposal channels they used. By engaging participants in this interview preparation task, their recollection of unused clothing items, disposed clothing items, and their experiences of clothing disposal were stimulated, facilitating a seamless interview process and obtaining valuable insights regarding their impressions of specific clothing items.

At the beginning of the interview, the interviewees were provided with a definition of clothing disposal, which encompassed various disposal channels including reuse and recycling options such as giving away, donation, reselling, using recycling containers, using online clothing recycling platforms (OCRPs), and throwing away.

Participants' demographic information, including age, occupation, marital status, number of children, and the disposal channels they commonly used, were collected from each participant (See table 8).

Table 8. Summary of Participant Demographics and Information on Unused Clothing Items and Disposal Experience.

Characteristics		
Age	Mean	38.19
	Range	30–43
Occupation	Involved in the clothing industry/area	5 (31.25%)
	Uninvolved in the clothing industry/area	11 (68.75%)
Marital status	Married	12 (75%)
	Single	3 (18.75%)
	Divorced	1 (6.25%)
Number of children	No children	5 (31.25%)
	One child	10 (62.5%)
	Two or more children	1 (6.25%)
The quantity of unused clothing items	Mean	74.88
	Range	34–218
The quantity of disposal clothing items this year	Mean	23.50
	Range	2–90
Disposal channel: conventional reuse and recycle	Yes	16 (100%)
	No	0 (0%)
Disposal channel: throw away	Yes	5 (31.25%)
	No	11 (68.75%)
Disposal channel: OCRP	Yes	2 (12.5%)
	No	14 (87.5%)

Among the 16 Chinese female consumers from Generation Y, their age ranged from 30 years to 43 years, with a mean age of 38.19. Regarding occupation, the participants showed diverse background. According to Atkins et al. (2017), a maximum variation approach for sampling strategy in exploratory studies is appropriate. Thus, participants both involved in and uninvolved in the clothing industry were included. The participants uninvolved in the clothing industry/area had occupations such as insurance agent, private owner of an electrical company, tourist, accountant, graphic designer, civil servant, archivist, foreign language educator, bank clerk, housewife, and primary school teacher. The participants involved in the clothing industry/area included three fashion design educators, a stylist, and a garment retail director. Regarding marital status, 75% of the participants were married, 18.75% were single, and 6.25% were divorced. In terms of the number of children, 62.5% of them had one child, 31.25% did not have children, and 6.25% had two children.

The quantity of unused clothing items reported by the participants ranged from 34 to 218, with a mean of 74.88. The quantity of disposed clothing items in the last year ranged from 0 to 90, with a mean of 23.38. 93.75% of the participants had

disposal experience with conventional reuse and recycle channels, including giving away, donation, recycling containers in community, resale, and repurpose (make it into rags or dog's clothing); 31.25% of the participants had disposal experience with throwing away the clothing items into general waste bins, while only 12.5% of the participants had disposal experience with OCRP.

Subsequently, the interview questions were designed to explore the factors influencing participants' behaviors related to the main barriers and facilitators to clothing disposal for unused clothing items and the usage of OCRP. The focus of the interviews revolved around the following key questions that corresponding to the sub-research question (SRQ) 1 and 2 of ***Study 2*** as shown in Table 9 (please refer to Appendix F for the detailed interview procedure):

Table 9. Key interview questions that corresponding to the research sub-questions.

SRQs of *Study 2*	**Key questions**
SRQ1: Using the COM and TDF, what are the main barriers and facilitators to clothing disposal for unused clothing items?	• Based on the information regarding the quantity and categories of clothing you disposed of, please explain the reasons behind your decision to dispose of specific clothing items. • Based on the information regarding the quantity and categories of unused clothing you provided, please explain the reasons why you have not disposed of these unused clothing items.
SRQ2: Using the COM and TDF, what are the main barriers and facilitators to the usage of OCRP for disposing of unused clothing items?	• Please explain why you chose to utilize or not utilize OCRP as clothing disposal channel.

3.3.4 Data coding and analysis

Addressing SRQ 1 and 2

To address research SRQ 1 and 2, which explore the main barriers and facilitators related to clothing disposal for unused clothing items and the usage of OCRP, a combined qualitative and quantitative analysis was employed. For the qualitative approach, the interview responses were analyzed using a combined inductive and deductive method as recommended by McGowan et al. (2020). The quantitative analysis was performed using IBM SPSS Statistics (version 28), incorporating Fisher's exact tests.

Initially, thematic analysis was conducted using an inductive approach (Braun & Clarke, 2006), which involved identifying, analyzing, and interpreting patterns and insights that emerged from the data. Thematic analysis approach is well-suited for

investigating the underlying reasons for people's usage or non-usage of a specific service or procedure (Ayres, 2007).

The data was fully transcribed and translated into English. To ensure the reliability of the data, the translations underwent meticulous review and correction by the researcher. The transcripts were thoroughly read and re-read to familiarize with the content, and open coding techniques were employed to assign codes to meaningful text segments. As the process of open coding reached saturation, a list of specific themes was generated. These themes were then compared and categorized into broader overarching themes, following the steps outlined by Braun and Clarke (2006) (See Appendix G). Subsequently, a deductive approach was employed to allocate themes with relevant textual content to one or more of the 14 theoretical domains outlined in the TDF (French et al., 2012), aligning them with COM components as directed by the linkage between COM and TDF in the BCW theory (see appendix A).

In the case of multiple themes being generated, the following criteria were applied to prioritize the most important themes, based on previous research (Patey et al., 2021):

(1) Relatively high frequency of specific themes: Themes that were frequently mentioned by multiple participants were given priority, as they indicated a widespread influence on clothing disposal behavior.

(2) Presence of conflicting beliefs: Themes that revealed opposing beliefs or perspectives about the same issue were considered significant, as they highlighted potential areas of tension and complexity within the behavior.

(3) Evidence of strong beliefs affecting the target behavior: Themes that reflected strong beliefs or attitudes with the potential to significantly impact clothing disposal behavior were considered important for further analysis.

By applying these criteria, the analysis aimed to identify the main barriers and facilitators that had the greatest relevance and influence on the disposal of unused clothing items and the usage of OCRP.

Based on the themes identified within COM components, a quantitative analysis was conducted to determine the main barriers and facilitators related to the target issues by comparing the involved components using Fisher's exact tests. All tests of statistical significance were two-sided, and statistical significance was accepted at $p \leq 0.05$. Frequencies and percentages were calculated and compared using Fisher's exact tests for count data. The chi-square partitioning method was applied to determine the pairwise comparison of groups.

Addressing SRQ 3 and 4

To address SRQ3 and 4, which suggest intervention and implementation options for promoting the disposal for unused clothing items and the usage of OCRP, the specific intervention functions, policy categories, BCTs and modes of delivery within BCW-related frameworks were determined. Intervention functions were identified by mapping the main barriers and facilitators within TDF using linkage matrices within the BCW framework. Policy categories were identified by mapping the identified intervention functions using linkage matrices within the BCW framework. BCTs were selected from the "most/less frequently used BCTs" list (See Appendix C) and were consulted along with their definition and examples through Behavior Change Technique Taxonomy v1 (BCTTv1) (See Appendix B) provided by Michie et al. (2014), and the mode of delivery was identified from the taxonomy provided by Michie et al. (2014). Our decisions regarding intervention functions, policy categories, BCTs, and mode of delivery were pre- and post-evaluated by the APEASE criteria, encompassing the factors of affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety, and equity, as part of the BCW approach.

Chapter 4. Results of *Study 1*: Identifying the clothing consumption issues that need to be addressed through examining the factors related to sustainable clothing consumption based on the categorization of Chinese consumers' behavior (*SRO1*)

4.1 Categorization of clothing consumption behavior of Chinese consumers (based on a matrix)

We categorized the clothing consumption behavior of Chinese consumers using a matrix based on TCI and NAWEI (wearing frequency). Behaviors were divided into four categories: large–active (L-A), small–active (S-A), small–passive (S-P), and large–passive (L-P) (see Figure 15).

A total of 3084 clothing items, including both TCI-1 and TCI-2 were owned from 60 participants. On average, participants owned 51.4 clothing items each for the designated season, with a range of 19 to 111 items. They wore these items an average of 3.97 times in a 30-day period, with a range of 1.61 to 10 items. A matrix was used to categorize sustainable clothing consumption behaviors, based on averages of two factors: TCI on the x-axes and NAWEI on the y-axes.

Participants who owned fewer than 51.4 clothing items (varying from 19 to 50) and wore items on average more than 3.97 times (ranging from 4.29 to 10) were categorized as S-A. Those who had fewer than 51.4 clothing items (varying from 31 to 49) and wore items on average fewer than 3.97 times (ranging from 2.5 to 3.91) were categorized as S-P. Finally, those who owned more than 51.4 clothing items (varying from 55 to 111) and wore items on average fewer than 3.97 times (ranging from 1.61 to 3.8) were categorized as large–passive. Therefore, the behaviors of the 60 participants were categorized as S-A (N = 21), small–passive (N = 15), and large–passive (N = 24); no behavior was categorized as L-A (See Figure 16). From Figure 16, it can be observed that category of S-A consists mainly men and the elderly, category of S-P is mainly composed of younger people, and L-P is mainly composed of females aged between 28 and 47 years old.

In this study, a comparison was then made between S-A, S-P, and L-P based on sustainable clothing consumption behaviors across the purchase, use, and disposal phases. For instance, a comparison could be made between S-A and L-P behaviors regarding disposal reasons and channels.

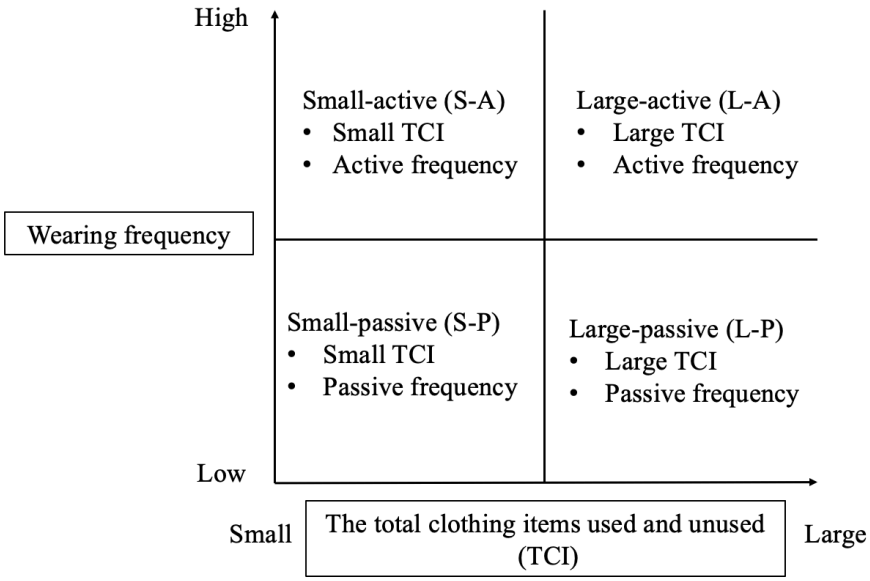

Figure 15. Matrix of TCI and NAWEI.

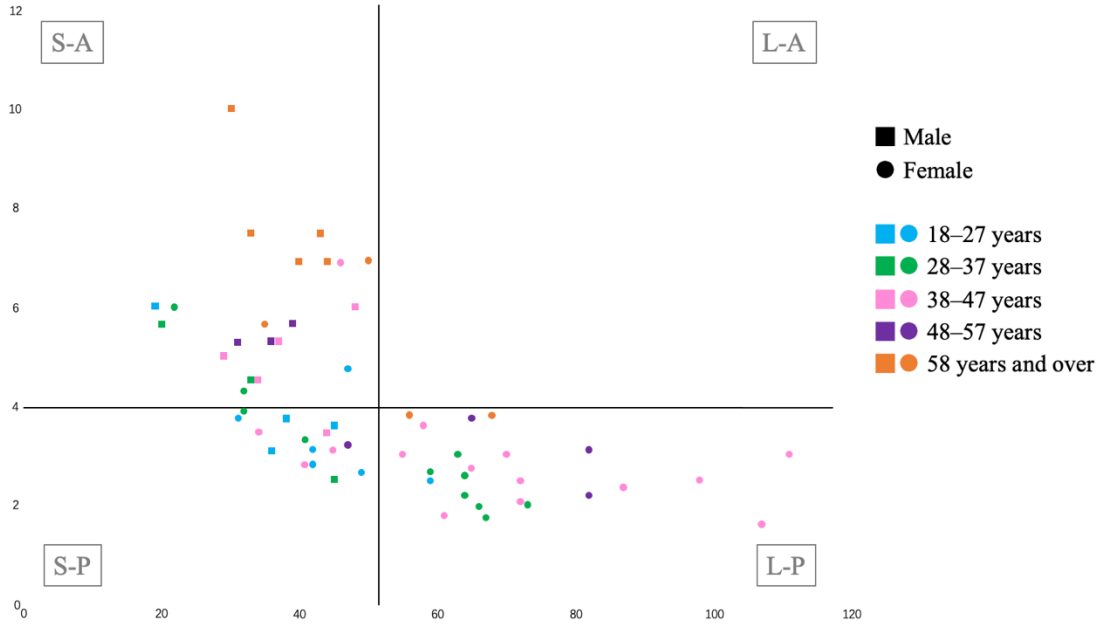

Figure 16. Matrix of TCI and NAWEI with data.

4.2 Factors that influence different types of consumption behaviors

To determine whether significant relationships existed between the behavioral categories of S-A, S-P, and L-P, Pearson's chi-squared and Fisher's exact tests were used for count data. As shown in Table 10, the results of a Chi-square test indicated that there are significant differences between the three categories with regards to gender ($Chi^2 = 25.714$; $p < 0.001$), preference for budget brands ($Chi^2 = 11.418$; $p = 0.003$), preference for casual/middle brands ($Chi^2 = 8.350$; $p = 0.015$), purchasing priority for fashionable/trendy items ($Chi^2 = 11.331$; $p = 0.003$), psychological reasons for disposal ($Chi^2 = 20.371$; $p < 0.001$), conventional reuse and recycling disposal channels ($Chi^2 = 12.702$; $p = 0.002$), disposal channel of throwing away ($Chi^2 = 6.724$; $p = 0.035$), and repair/repurpose experience ($Chi^2 = 8.449$; $p = 0.015$). The results of a Fisher's exact test indicated that there are significant differences between the three categories with regards to age ($p = 0.012$), annual expenditure on clothing ($p < 0.001$), volume of new clothing this year ($p < 0.001$), purchase priorities for environment ($p < 0.001$), disposal quantity ($p = 0.01$), use duration for designated tops ($p = 0.021$), use duration for designated bottoms ($p = 0.034$), price for designated bottoms ($p = 0.04$), and clothing type for designated bottoms ($p = 0.008$). To determine the specific significant relationship between behavioral categories, a pairwise comparison of groups was performed using the chi-square partition method.

Table 10. Comparison of clothing consumption behavior categories for count data.

Items	Answer Categories	Categorization						Value	Sig. (2-sided)
		Small-active		Small-passive		Large-passive			
		N	%	*N*	%	*N*	%		
Gender	Female	6_a	28.6%	10_a	66.7%	24_b	100.00%	25.714	<0.001***[a]
	Male	15_a	71.4%	5_a	33.3%	0_b	0.00%		
Age	18–27 years	2_a	9.5%	7_b	46.7%	1_a	4.2%	–	0.012*[b]
	28–37 years	4_a	19.0%	3_a	20.0%	7_a	29.2%		
	38–47 years	5_a	23.8%	4_a	26.7%	11_a	45.8%		
	48–57 years	3_a	14.3%	1_a	6.7%	3_a	12.5%		
	58 years or over	7_a	33.4%	0_b	0.00%	$2_{a,b}$	8.3%		
Brand preference: budget brand	No	$6_{a,b}$	28.6%	1_b	6.7%	14_a	58.37%	11.418	0.003**[a]
	Yes	$15_{a,b}$	71.4%	14_b	93.3%	10_a	41.7%		
Brand preference: casual/middle brand	No	12_a	57.1%	$7_{a,b}$	46.7%	4_b	16.7%	8.350	0.015*[a]
	Yes	9_a	42.9%	$8_{a,b}$	53.3%	20_b	83.3%		
Annual expenditure on clothing (RMB)	2000 or below	8_a	38.1%%	0_b	0.00%	0_b	0.00%	–	<0.001***[b]
	2001—5000	8_a	38.1%	3_a	20.0%	3_a	12.5%		
	5001—10000	3_a	14.3%	3_a	20.0%	5_a	20.8%		
	10001—20000	1_a	4.8%	9_b	60.0%	6_b	25.0%		
	20001 or above	1_a	4.8%	0_a	0.00%	10_b	41.7%		

Table 10. Cont.

Items	Answer Categories	Categorization						Value	Sig. (2-sided)
		Small-active		Small-passive		Large-passive			
		N	%	*N*	%	*N*	%		
Number of new clothing this year	5 items or fewer	13_{a}	61.9%	2_{b}	13.3%	1_{b}	4.2%	–	<0.001***[b]
	6—20 items	$8_{a,b}$	38.1%	9_{a}	60.0%	5_{b}	20.8%		
	21—40 items	0_{a}	0.00%	4_{b}	26.7%	12_{b}	50.0%		
	41items or more	0_{a}	0.00%	0_{a}	0.00%	6_{b}	25.0%		
Purchase priorities: fashion/trendy	No	17_{a}	81.0%	4_{b}	26.7%	16_{a}	66.7%	11.331	0.003**[a]
	Yes	4_{a}	19.0%	11_{b}	73.3%	8_{a}	33.3%		
Disposal reasons: Psychological	No	16_{a}	76.2%	4_{b}	26.7%	3_{b}	12.5%	20.371	<0.001***[a]
	Yes	5_{a}	23.8%	11_{b}	73.3%	21_{b}	87.5%		
Disposal channel: conventional	No	13_{a}	61.9%	$4_{a,b}$	26.7%	3_{b}	12.5%	12.702	0.002**[a]
	Yes	8_{a}	38.1%	$11_{a,b}$	73.3%	21_{b}	87.5%		
Disposal channel: throw away	No	8_{a}	38.1%	$7_{a,b}$	46.7%	18_{b}	75.0%	6.724	0.035*[a]
	Yes	13_{a}	61.9%	$8_{a,b}$	53.3%	6_{b}	25.0%		
Disposal quantity	10 items or fewer	14_{a}	66.7%	$6_{a,b}$	40.0%	6_{b}	25.0%	–	0.01*[b]
	11—20 items	6_{a}	28.6%	6_{a}	40.0%	5_{a}	20.8%		
	21—30 items	1_{a}	4.8%	2_{a}	13.3%	6_{a}	25.0%		
	31items or more	0_{a}	0.00%	$1_{a,b}$	6.7%	7_{b}	29.2%		
Repair/repurpose experience this year	No	4_{a}	19.0%	10_{b}	66.7%	$11_{a,b}$	45.8%	8.449	0.015*[a]
	Yes	17_{a}	81.0%	5_{b}	33.3%	$13_{a,b}$	54.2%		

Table 10. Cont.

Items	Answer Categories	Categorization						Value	Sig. (2-sided)
		Small-active		Small-passive		Large-passive			
		N	%	*N*	%	*N*	%		
Attributes of IWHF (tops): duration of use	Less than 1year	2_a	9.5%	9_b	60.0%	$8_{a,b}$	33.3%	–	0.021*[b]
	1—3 years	13_a	61.9%	4_a	26.7%	13_a	54.2%		
	More than 3 years	6_a	28.6%	2_a	13.3%	3_a	12.5%		
Attributes of IWHF (bottoms): duration of use	Less than 1year	4_a	19.0%	8_a	53.3%	7_a	29.2%	–	0.034*[b]
	1—3 years	6_a	28.6%	4_a	26.7%	13_a	54.2%		
	More than 3 years	11_a	52.4%	$3_{a,b}$	20.0%	4_b	16.7%		
Attributes of IWHF (bottoms): price (RMB)	200 or below	8_a	38.1%	5_a	33.3%	1_b	4.1%	–	0.04*[b]
	201—500	10_a	47.6%	6_a	40.0%	18_a	75.0%		
	501—1000	1_a	4.8%	3_a	20.0%	3_a	12.5%		
	1001—2000	1_a	4.8%	0_a	0.00%	0_a	0.00%		
	2001or above	1_a	4.8%	1_a	6.7%	2_a	8.3%		
Attributes of IWHF (bottoms): clothing type	Jeans	4_a	19.0%	$6_{a,b}$	40.0%	15_b	62.5%	–	0.008**[b]
	Sports/knitted trousers	11_a	52.3%	$6_{a,b}$	40.0%	3_b	12.5%		
	Skirt	0_a	0.00%	0_a	0.00%	3_a	12.5%		
	Other trousers	6_a	28.6%	3_a	20.0%	3_a	12.5%		

Each subscript letter denotes a subset of group categories whose column proportions do not differ significantly from each other at the level of 0.05. *P< 0.050, ** P< 0.010, *** P< 0.001. [a]Pearson chi-square; [b]Fisher exact test.

4.2.1 Demographics

As for gender, the proportion of female participants was significantly higher in L-P (100%) than in S-P (66.7%) and S-A (28.8%), while the proportion of male participants in S-A (71.4%) and S-P (33.3%) was significantly higher than that in L-P (0%) (Table 10). This indicates that female participants contributed more to large TCI and passive usage frequency, whereas male participants contributed more to small TCI and active usage frequency.

Among the behavioral categories, age is a significant predictor. A significant difference was found in the age range of 18–27 years. A higher proportion of young consumers in S-P (46.7%) than in S-A (9.5%) and L-P (4.2%) indicates that young consumers contributed more to small TCI and passive usage frequency. A significant difference was also found in the age range of 58 years and over, with a higher proportion of older consumers in S-A (33.4%) than in L-P (8.3%) and S-P (0.00%), indicating that older consumers contributed more to small TCI and active usage frequency.

Demographic factors, such as education status and income level, were found to be non-significant predictors between categories in this study.

4.2.2 Purchase behavior

The difference in budget brand preference among the three categories was significant. The proportion of consumers who preferred budget brands in the S-P (93.3%) and S-A (71.4%) was significantly higher than that in L-P (41.7%) (Table 10). Meanwhile, the difference in the preference for casual/middle brands among the three behavioral categories was significant. The proportion of consumers who preferred casual/middle brands in L-P (83.3%) was significantly higher than in S-P (53.3%) and S-A (42.9%).

When it comes to annual expenditure on clothing, the proportion of participants with a price range of RMB 2000 and below in S-A (38.1%) was significantly higher than that in S-P (0.0%) and L-P (0.0%). The proportion of participants with a price range of RMB 10,001–20,000 in S-A (4.8%) was significantly lower than that in S-P (60.0%) and L-P (25.0%). The proportion of participants with a price range of RMB 20,001 or above in the L-P group (41.7%) was significantly higher than that in the C-SA (4.8%) and S-P (0.0%) groups. The results indicate that L-P contributes more to expenditure on clothing, S-P contributes more to expenditure on clothing, and S-A contributes less to expenditure on clothing.

New items this year differed significantly between categories. The proportion of

participants with fewer than five new items in S-A (61.9%) was significantly higher than that in S-P (13.3%) and L-P (4.2%); the proportion of participants with 6–20 new items in S-P (60.0%) was significantly higher than that in S-A (38.1%) and L-P (20.8%); the proportion of participants with 21–40 new items in L-P (50.67%) and in S-P (25%) was significantly higher than that in S-A (0.00%); and the proportion of participants with 41 or more new items in L-P (25.0%) was significantly higher than that in S-P (0.0%) and S-A (0.0%). The results indicate that L-P contributes more to a large clothing inflow, S-P contributes moderately to a large clothing inflow, and S-A contributes less to a large clothing inflow.

The purchase priorities of fashionable/trendy items differ significantly. The proportion of participants considering fashionable/trendy items when purchasing in S-P (73.3%) was significantly higher than that in L-P (33.3%) and S-A (19.0%), indicating that fashionable/trendy items are more important to S-P consumers.

4.2.3 Use behavior

As shown in Table 10, repair/repurpose experience this year among behavior categories is a significant predictor. S-A participants (81.0%) had significantly more repair/repurpose experience than L-P (54.2%) and S-P participants (33.3%), while L-P participants had significantly more repair/repurpose experience than S-P participants. This indicates that participants from S-A were most likely to extend their clothing's lifespan through repair, followed by those from L-P, and S-A were the least likely to extend their clothing lifespan through repair.

In terms of IWHF attributes, there were significant differences between categories regarding use duration for designated tops and bottoms, as well as price and clothing type for designated bottoms. S-P participants (60%) used designated tops purchased less than one year ago at a rate significantly higher than that of L-P participants (33.3%) and S-A participants (9.5%). In S-A (52.4%), the proportion of participants wearing long-duration bottoms was significantly higher than that in S-P (20.0%) and L-P (16.7%), indicating that S-A was more likely to wear long-duration bottoms frequently. The proportion of participants wearing designated bottoms at prices below 200 RMB in S-A (38.1%) and S-P (33.3%) was significantly higher than that in S-P (4.1%), indicating that participants in S-A and S-P were more likely to wear low-cost bottoms. L-P (62.5%) had a significantly higher proportion of participants wearing the designated bottoms of jeans than S-P (40.0%) and S-A (19.0%), and S-P was also higher than S-A. Sports and knitted trousers were used by more participants in S-A (52.3%) than in S-P (40.0%) or L-P (12.5%).

We carried out a one-way ANOVA, followed by pairwise comparisons using the Bonferroni test to determine the significant relationship in terms of TCI-2 between behavior categories. As shown in Table 11, significant differences were found between the behavioral categories in terms of TCI-2 ($F = 19.599$, $p < 0.001$). There was a significant contribution of L-P (Mean = 35.71; SD = 15.71) to TCI-2 compared with S-A (Mean = 20.24; SD = 10.27) and S-P (Mean = 12.53; SD = 4.44), respectively. This suggests that L-P participants owned more TCI-2s.

Table 11. Comparison of clothing consumption behavior categories in terms of TCI-2.

Categories	N	TCI-2 mean±SD	*P*
Small-active	21	20.24±10.27	<0.001
Small-passive	15	12.53±4.44	
Large-passive	24	35.71±15.71*#	

*Compared with small-active, the difference was statistically significant
#Compared with small-passive, the difference was statistically significant

There were no significant contributions of predictors such as brand level and fiber content for tops, outerwear, and bottoms to the use phase factors when comparing different categories.

4.2.4 Disposal behavior

As shown in Table 10, there was a significant difference in psychological reasons for disposal between the categories: L-P (87.5%) and S-P participants (73.3%) disposed of items for psychological reasons significantly more than S-A participants (23.8%).

In terms of the conventional channels of reuse and recycling, disposal channels differ significantly between the categories. Participants who disposed of items through the conventional channels of reuse and recycling were significantly higher in L-P (87.5%) and S-P (73.4%) compared to S-A participants (38.1%), indicating that L-P and S-P contributed more to conventional sustainable disposal. Meanwhile, S-A (61.9%) contributed more to the channel of throwing away, followed by S-P (53.3%) and L-P (25.0%).

There was a significant difference in the proportion of participants disposing of fewer than 10 items: S-A had the highest proportion (66.7%), followed by S-P (40.0%) and L-P (25.0%). Meanwhile, the proportion of participants disposing of more than 31 items in L-P (29.2%) was significantly higher than in S-P (6.7%) and S-A (0.00%). The results indicate that L-P contributed more to the disposal quantity, followed by S-P, and last by S-A.

Chapter 5. Results of *Study 2* (case study): Develop a procedural method for promoting sustainable clothing disposal behavior among Generation Y Chinese Female Consumers based on the identified categorization of behavioral issues (*SRO2*)

5.1 Barriers and facilitators of clothing disposal behavior in successful/failed cases among generation Y Chinese female consumers

Results from the qualitative method

Through qualitative analysis, themes were identified as barriers and facilitators influencing clothing disposal behavior among generation Y Chinese female consumers based on their successful/failed cases. This includes the main barriers and facilitators to clothing disposal for unused clothing items (associate with SRQ1) and the main barriers and facilitators to the usage of OCRP (associate with SRQ2).

These themes were generated through an inductive process and subsequently mapped to multiple domains and sub-domains of the TDF, and aligned with the corresponding COM components for the purpose of effective organization and categorization. Specifically, concerning the disposal of unused clothing items (SRQ1), a total of 8 domains were identified though barrier and facilitator themes. These include the domains of environmental context and resources; memory, attention and decision process; skills; beliefs about consequences; intentions; goals; emotion; and social influence. Additionally, within the domain of environment context and resources in the TDF, the sub-domains of attributes of the clothing item, situational factors related to events and time constraints, and availability of wardrobe were identified and delineated (see table 12). This alignment of domains and sub-domains with COM components revealed that all COM components were implicated in barriers, whereas five specific components (physical capability, physical opportunity, social opportunity, reflective motivation, and automatic motivation) emerged as

facilitators.

Similarly, when examining the usage of OCRP (SRQ2), a total of 3 domains and were identified through barrier and facilitator themes. These include the domains of knowledge, beliefs about consequences, and environment context and resources. Additionally, within the domain of environment context and resources in the TDF, the sub-domains of situational factors related to disposal channels was identified and delineated (see table 13). By aligning these domains and sub-domains to COM components, it became evident that barriers were influenced by the components of psychological capability and reflective motivation, whereas facilitators were driven by psychological capability and physical opportunity.

Table 12. Descriptions, frequencies, and quotes for generated themes (SRQ 1: Using the COM and TDF, what are the main barriers and facilitators to clothing disposal for unused clothing items?).

Quote	Barrier/ Facilitator	Frequency (%)	Theme	Theme Description	TDF Domain/ Sub-domain	COM-B component
"*I **dispose of** old clothing items that are **pilling, fading, have loose collars, or are misshapen**.* "ID13	Facilitator	15 (93.75%)	Attributes of the clothing item	Attributes of the clothing item include the condition, material component, and damage severity.	Environment context and resources: Attributes of the clothing item	Physical opportunity
"***Formal-style** clothing items, even though I don't currently wear them, are in **perfect condition with no damage or defects**, and their **quality is excellent with great materials**. So, I find it **difficult to dispose** of them.*" ID 02	Barrier	10 (62.5%)				
"*My **wardrobe is small**, so I **need to dispose** of the clothes in order to make space for new ones.*" ID 10	Facilitator	2 (12.5%)	Availability of wardrobe	Access to necessary resources such as wardrobe and space.	Environment context and resources: Availability of wardrobe	
"*I had some boots and sneakers that I wanted to dispose of, but since there was still **space in the shoe cabinet**, I decided to **keep them there for now**.*" ID 07	Barrier	3 (18.75%)				
"*This year, I **disposed of** a large number of clothes during my **move**.*" ID 05	Facilitator	5 (31.25%)	Sailent events	Salient event that encourages the behavior of clothing disposal	Environment context and resources: Situational factors related to events and time constraints	
"*I am usually very busy with work, so I really **don't have time to handle clothing disposal**. I need a dedicated block of free time to sort through my clothes.*" ID 08	Barrier	6 (3.75%)	Time constraints	Lack of time to handle clothing disposal		

Table 12. Cont.

Quote	Barrier/ Facilitator	Frequency (%)	Theme	Theme Description	TDF Domain	COM-B component
*"Some clothing items were placed in inconspicuous positions in my wardrobe and were **forgotten** when it came **to disposal**. Through this activity, I thoroughly organized my wardrobe and finally found them."* ID 04	Barrier	6 (37.5%)	Memory	Remembering to dispose unwanted clothing items	Memory, attention and decision process	Psychological capability
*"I **repurposed** an unwanted hoodie into an outfit for my dog.*" ID 03	Facilitator	3 (18.75%)	Skills development	Having the skills to dispose of clothing properly	Skills	Physical capability
*"I'm **not good at sorting wardrobes**, and the items in my wardrobe are not arranged according to a specific pattern. Some items are difficult to locate, so it's **not easy for me to dispose of them**"* ID 08	Barrier	1 (6.25%)				
"*There are also some clothing items that are relatively new but have been stored for a long time. I think they could **be very useful to someone else**.*" ID15	Facilitator	5 (31.25%)	Outcome expectancies	Outcome expectancies regarding the disposal of certain clothing items	Beliefs about consequences	Reflective motivation
"*The items from fast fashion brands are **difficult to give away** as the decorative elements on these clothes easily become outdated. For example, I have a ZARA leather jacket with exaggerated shoulder design and decorative rivets, which no longer matches current trends. **I highly doubt that anyone else would have a need for such clothing.***" ID 03	Barrier	4 (25%)				

Table 12. Cont.

Quote	Barrier/ Facilitator	Frequency (%)	Theme	Theme Description	TDF Domain	COM-B component
"*My children have grown up, and they have acquired more and more clothing and other items. I **have to dispose of** many of my unnecessary clothes in the wardrobes to make space for their belongings."* ID 01	Facilitator	3 (18.75%)	Intention to/not to dispose	Interest and willingness to dispose of clothing items	Intentions	Reflective motivation
"*I am really **lazy when it comes to clothing disposal**. Currently, I prefer **not to dispose of** them, because sorting clothes requires a lot of time and energy.* "ID 16	Barrier	11 (68.75%)				
"*Some of the clothing items **I don't dispose of** because **I believe they will come back into fashion in the future and can still be worn**. For example, fitted blazers may temporarily go out of style, but oversized blazers have been trendy in recent years. So, I plan to keep some well-fitted blazers and wear them when fitted styles become popular again. There are also some jackets with details that are currently not trendy, such as narrow lapel design. I intend to continue wearing them in the future when those elements come back into fashion*." ID 09	Barrier	15 (93.75%)	Action planning	The alternative behaviors that an individual wants to achieve beyond disposal.	Goals	

Table 12. Cont.

Quote	Barrier/ Facilitator	Frequency (%)	Theme	Theme Description	TDF Domain	COM-B component
"*Those clothing items **I disposed of** are too plain, not easy to match with other items, and make me feel **bored**.*" ID 05	Facilitator	3 (18.75%)	Boredom to clothing	Feeling bored with their clothing items	Emotion	Automatic motivation
"*I **don't want to easily give away** items that hold **sentimental value** to me. There is a dress that a close friend gave me during university. I have kept it hanging in my wardrobe all this time. Even though I cannot fit into it due to my current body shape, at least seeing it makes me feel good.*" ID 12	Barrier	5 (31.25%)	Attachment to clothing and emotions derived	Having an emotional attachment to their clothing items		
"***My mother and niece** are willing to **take the clothes I don't need**.*" ID 14	Facilitator	8 (50%)	Social support	Support from friends or family when disposing of clothing items	Social influence	Social opportunity
"***Others may not be willing to accept my old clothes**, and it's even more **difficult to give away** shoes.*" ID11	Barrier	6 (37.5%)	Social pressure	Worrying about others' opinions regarding one's unwanted clothing items.		

Table 13. Descriptions, frequencies, and quotes for generated themes (SRQ 2: Using the COM and TDF, what are the main barriers and facilitators to the usage of OCRP for disposing of unused clothing items?).

Quote	Barrier/ Facilitator	Frequency (%)	Theme	Theme Description	TDF Domain	COM-B component
"*This year, I **disposed of** a batch of clothing items by **using the 'Feimayi' platform** (an online recycling platform in China). I found it through the Alipay app (an online payment app in China)*" ID 15	Facilitator	1 (6.25%)	Procedural knowledge	Knowing how to dispose of clothing, or being aware of services of OCRP	Knowledge	Psychological capability
*"**I do not know** the alternative methods for disposing of clothing items apart from giving them away or discarding them."* ID 05	Barrier	9 (56.25%)				
*"I think OCRPs **can efficiently recycle old clothes and benefit the environment**."* ID 04	Facilitator	1 (6.25%)	Outcome expectancies	Outcome expectancies regarding the usage of OCRP	Beliefs about consequences	Reflective motivation
"*My area **does not seem to offer this service**.*" ID 09	Barrier	2 (12.5%)	Availability of resources	Access to OCRP	Environment context and resources: Situational factors related to disposal channel	Physical opportunity
"*Booking procedure is **too complicated,** and this platform **requires a minimum of three kilograms of old clothes** to be recycled, and I **don't have** that many clothes to dispose of every time.*" ID 02	Barrier	1 (6.25%)	Inconvenience of using the disposal channel	Difficulties of disposing of clothing items via OCRP		
"*Using disposal **containers in the communities or giving items away** is **more convenient** than using OCRP.*" ID 07	Barrier	3 (18.75%)	Convenience of alternative disposal channels	Ease of disposing of clothing items via other channels		

Results from the quantitative method

Based on the frequency of barriers and facilitators concerning issues related to SRQ1, and by mapping them to the COM components, the frequencies of physical capability, psychological capability, physical opportunity, social opportunity, reflective motivation and automatic motivation components were determined, as shown in Table 14. Similarly, based on the frequency of barriers and facilitators related to SRQ2, and following the mapping to the COM components, the frequencies of psychological capability, physical opportunity, and reflective motivation components were determined, as shown in Table 15.

Table 14. Frequency of COM-B components involved in SRQ1.

COM components	Barrier	Facilitator	Grand Total
Physical Capability	1	3	4
Psychological Capability	6	0	6
Physical Opportunity	19	22	41
Social Opportunity	6	8	14
Reflective Motivation	30	8	38
Automatic Motivation	5	3	8
Grand Total	67	44	111

Table 15. Frequency of COM-B components involved in SRQ2.

COM	Barrier	Facilitator	Grand Total
Psychological Capability	9	1	10
Physical Opportunity	0	1	1
Reflective Motivation	6	0	6
Grand Total	15	2	17

To determine whether significant differences existed among the involved COM components in terms of barriers and facilitators, Fisher's exact test was employed for count data. As shown in Table 16, the results of a Fisher's exact test revealed that there are significant differences between the six involved COM components with regards to barriers or facilitators for SRQ1 (Fisher's exact value = 16.684; $p = 0.003$). However, for SRQ 2, the Fisher's exact test findings demonstrated no significant difference among the three implicated COM components concerning barriers or facilitators (Fisher's exact value = 4.581; $p > 0.05$). To determine the specific significant relationship between COM components for SRQ1, a pairwise comparison of groups was performed using the chi-square partition method.

Table 16. Comparison among involved COM-B components with regards to barriers and facilitators for SRQ1.

Items	Answer Categories		COM components						Fisher's Exact Text Value	Sig. (2-Sided)
			Capability		Opportunity		Motivation			
			Physical	Psychological	Physical	Social	Reflective	Automatic		
Barriers/ Facilitators	Barriers	*N*	$1_{a,b}$	$6_{a,b}$	19_{a}	$6_{a,b}$	30_{b}	$5_{a,b}$	16.684	0.003**
		%	1.5%	9.0%	28.4%	9.0%	44.8%	7.5%		
	Facilitators	*N*	$3_{a,b}$	$0_{a,b}$	22_{a}	8_{b}	8_{b}	$3_{a,b}$		
		%	6.8%	0%	50.0%	18.2%	18.2%	6.8%		

Each subscript letter denotes a subset of group categories whose column proportions do not differ significantly from each other at the level of 0.05. *P< 0.050, ** P< 0.010, *** P< 0.001.

As shown in Table 16, the difference in barriers of the issue regarding disposal of unused clothing items among the six components was significant. The highest proportion of barriers was associated with reflective motivation (44.8%), followed by physical opportunity (28.4%). Conversely, psychological capability (9.0%), social opportunity (9.0%), automatic motivation (7.5%), and physical capability (1.5%) exhibited comparatively lower proportions.

Meanwhile, the difference in the facilitators among the involved components was significant. Notably, the highest proportion of facilitators was related to physical opportunity (50.0%), followed by reflective motivation (18.2%) and social opportunity (18.2%). Conversely, physical capability (6.8%), automatic motivation (6.8%), and psychological capability (0%) displayed relatively lower proportions.

Therefore, in addressing SRQ1, the main barriers to clothing disposal for unused clothing comprised components related to reflective motivation and physical opportunity. This included intention not to dispose, negative outcome expectancies, environmental context and resources (specifically, attributes of clothing items, situational factors related to time constraints, and availability of wardrobe) within the TDF domains. Meanwhile, the main facilitators to clothing disposal for unused clothing were linked to the physical opportunity, social opportunity and, reflective motivation components. These included environmental context and resources (attributes of clothing items, situational factors related to time constraints, and availability of wardrobe), intention to dispose, positive outcome expectancies, and social support within the TDF domains. As for SRQ2, while no significant difference was noted between the components, based on frequency, psychological capability and physical opportunity were identified as the main barriers. These include procedural knowledge and environmental context and resources (situational factors related to disposal channel) within the TDF domains. No main facilitators were identified due to the limited frequency.

5.2 Intervention and implementation options for promoting sustainable clothing disposal behavior

Based on the barriers and facilitators identified using the COM and TDF, significant areas requiring change were recognized among the main barriers and facilitators within specific domains and sub-domains of the TDF. These areas became the focal points for intervention development.

To determine intervention and implementation options for promoting the

disposal for unused clothing items (SRQ3), specific intervention functions, policy categories, BCTs and modes of delivery were identified and selected for the main barriers and facilitators, based on the findings of SRQ1. Similarly, to determine intervention and implementation options for promoting the usage of OCRP (SRQ4), specific intervention functions, policy categories, BCTs and modes of delivery were identified and selected for the main barriers, based the findings of SRQ2. The identification of intervention functions and policy categories was accomplished through mapping the barriers and facilitators within TDF domains and sub-domains using linkage matrices from Michie et al. (2014) within the BCW framework. Following this, the selection of BCTs was informed by referring to the "most/less frequently used BCTs" lists (See Appendix C) and were consulted along with their definitions and examples through the BCTTv1 (See Appendix B). Modes of delivery for the interventions were determined using the "Taxonomy of modes of delivery for intervention functions that involve communication" (Figure 8). The evaluation of all these intervention and implementation options was conducted based on the APEASE criteria.

5.2.1 Identification of intervention functions

To determine intervention functions for SRQ3, based on the TDF domains and sub-domains identified from the main barrier themes, and using linkage matrices from Michie et al. (2014) within the BCW framework, all six pre-evaluated candidate intervention functions (education, persuasion, incentivization, environmental restructuring, modelling, and enablement) were identified by mapping the barriers for SRQ3 (see Table 17). These pre-evaluated candidate intervention functions were subsequently post-evaluated using the APEASE criteria developed by (Michie et al., 2014).

Similarly, based on the TDF domains and sub-domains identified from the main facilitator themes, and using linkage matrices, all six pre-evaluated candidate intervention functions were identified by mapping the facilitators for SRQ3 (see Table 18). These pre-evaluated candidate intervention functions were subsequently post-evaluated using the APEASE criteria.

Regarding intervention functions for SRQ4, based on the TDF domains and sub-domains identified from the main barrier themes, and using linkage matrices, three pre-evaluated candidate intervention functions (education, environmental restructuring, and enablement) were identified by mapping the barriers for SRQ4 (see Table 19). These pre-evaluated candidate intervention functions were subsequently post-evaluated using the APEASE criteria.

Table 17. Mapping of identified TDF domains and sub-domains of main barriers to intervention functions (SRQ3).

Barrier in TDF Domains and Sub-domains		Candidate Intervention Functions	Definition	Evaluation using the APEASE criteria
Goals		Education	Increasing knowledge or understanding	Yes, the intervention can include education about disposal guidelines, providing rational options for individuals to select based on their specific circumstances.
		Persuasion	Using communication to induce positive or negative findings or stimulate action	Not practicable and effective, as consumers may have plans that include sustainable elements.
		Incentivization	Creating an expectation of reward	Not practicable and cost-effective to deliver in this context.
		Modeling	Providing an example for people to aspire to or imitate	Not practicable and effective, as consumers may have plans that include sustainable elements.
		Enablement	Increasing means/ reducing barriers to increase capability or opportunity	Not practicable and efficient to deliver in this context.
Intentions		Education	(As above)	Yes, the intervention can include education about disposal guidelines and also why they are important to follow.
		Persuasion	(As above)	Yes, the intervention can induce positive feelings and inspire actions.
		Incentivization	(As above)	Yes, the intervention can include incentivization by providing rewards to encourage individuals to dispose of clothes.
		Modeling	(As above)	Yes, the intervention can include modelling, providing examples for people to aspire to.
Beliefs about consequences (Negative)		Education	(As above)	Yes, the intervention can include education about disposal guidelines, including specific outcomes associated with each disposal channel.
		Persuasion	(As above)	Yes, the intervention can induce positive feelings and inspire actions.
		Modeling	(As above)	Yes, the intervention can include modelling, providing examples for people to aspire to.
Environmental context and resources	Attributes (good quality) of the clothing item	Environmental restructuring	Changing the physical or social context	Yes, the intervention can offer individuals convenient facilities and service for clothing items with good quality.
		Enablement	(As above)	Yes, the intervention can include strategies to reduce barriers and cultivate mental resilience for active engagement in them.

	Situational factors related to time constraints	Environmental restructuring	(As above)	Yes, the intervention can offer individuals convenient facilities and time-saving service.
		Enablement	(As above)	Yes, the intervention can include strategies to reduce barriers and cultivate mental resilience for active engagement in them.
	Availability of wardrobe	Environmental restructuring	(As above)	Yes, the intervention can offer individuals with a service that includes reminder functions for wardrobe sorting and clothing disposal.
		Enablement	(As above)	Yes, the intervention can include strategies to reduce barriers and cultivate mental resilience for active engagement in them.

Table 18. Mapping of identified TDF domains and sub-domains of main facilitators to intervention functions (SRQ3).

Barrier in TDF Domains and Sub-domains		Candidate Intervention Functions	Evaluation using the APEASE criteria
Environmental context and resources	Attributes (damage) of the clothing item	Environmental restructuring	Yes, the intervention can offer individuals convenient facilities and service to uphold and promote the disposal of clothing with damage attributes, or to provide repair services.
		Enablement	Yes, the intervention can include strategies to enhance individuals' positive attitudes towards desired behaviors and cultivate mental resilience for active engagement in them.
	Situational factors related to event	Environmental restructuring	Yes, the intervention can offer individuals convenient facilities and service tailored to their situational events.
		Enablement	Yes, the intervention can include strategies to enhance individuals' positive attitudes towards desired behaviors and cultivate mental resilience for active engagement in them.
	Availability of wardrobe	Environmental restructuring	Yes, the intervention can offer individuals with a service that includes tips of proper wardrobe management and clothing disposal.
		Enablement	Yes, the intervention can include strategies to enhance individuals' positive attitudes towards desired behaviors and cultivate mental resilience for active engagement in them.
Intentions		Education	Yes, the intervention can include education about disposal guidelines and also why they are important to follow.
		Persuasion	Not practicable, as consumers have intentions to disposal in this context.
		Incentivization	Yes, the intervention can include incentivization by providing rewards to encourage individuals to dispose of clothes.
		Modeling	Not practicable, as consumers have intentions to disposal in this context.
Beliefs about consequences (Positive)		Education	Yes, the intervention can include education about disposal guidelines, including specific outcomes associated with each disposal channel.
		Persuasion	Yes, the intervention can induce positive feelings and inspire actions.
		Modeling	Yes, the intervention can include modelling, providing examples for people to aspire to.
Social influences		Restriction	Not acceptable to consumers.
		Environmental restructuring	Yes, the intervention can offer individuals facilities and service with social activities encouraging clothing disposal.
		Modeling	Yes, the intervention can provide examples for people to aspire to, thus further encouraging their disposal actions.
		Enablement	Yes, the intervention can include strategies to enhance individuals' positive attitudes towards desired behaviors and cultivate mental resilience for active engagement in them.

Table 19. Mapping of identified TDF domains and sub-domains of main barriers to intervention functions (SRQ4).

Barrier in TDF Domains and Sub-domains	**Candidate Intervention Functions**	**Evaluation using the APEASE criteria**
Knowledge	Education	Yes, the intervention can include education about the disposal instructions of OCRP and its benefits.
Environmental context and resources: Situational factors related to disposal channel	Training	Not practicable and efficient in this context.
	Environmental restructuring	Yes, the intervention can offer individuals convenient functions and service for OCRP.
	Enablement	Yes, the intervention can include strategies to reduce barriers and cultivate mental resilience for active engagement in using OCRP.

Consequently, for SRQ3, the identified intervention functions concerning the barriers encompass education, persuasion, incentivization, modeling, environmental restructuring, and enablement. Regarding the facilitators, the identified intervention functions include environmental restructuring, enablement, education, and incentivization. For SRQ4, the identified intervention functions concerning the barriers include education, environmental restructuring, and enablement.

5.2.2 Identification of policy categories

To determine policy categories for SRQ3, based on the identified intervention functions from the main barrier themes, and using linkage matrices from Michie et al. (2014) within the BCW framework, all five pre-evaluated candidate policy options (communication/marketing, fiscal measures, regulation, environmental/social planning, and service provision) were identified by mapping the identified intervention functions for barriers for SRQ3 (see Table 20). Subsequently, the pre-evaluated candidate policy categories were post-evaluation using the APEASE criteria developed by Michie et al. (2014).

Based on the identified intervention functions from the main facilitator themes, and using linkage matrices, all five pre-evaluated candidate policy options (communication/marketing, fiscal measures, regulation, environmental/social planning, and service provision) were identified by mapping the identified intervention functions for facilitators for SRQ3 (see Table 21). These pre-evaluated candidate policy categories were then post-evaluated using the APEASE criteria.

Regarding policy categories for SRQ4, based on the identified intervention functions from the main barrier themes, and using linkage matrices, all five pre-evaluated candidate policy options (communication/marketing, fiscal measures, regulation, environmental/social planning, and service provision) were identified by mapping the identified intervention functions for barriers for SRQ4 (see Table 22). Subsequently, the APEASE criteria were used to post-evaluate these candidate policy categories.

Table 20. Mapping of identified intervention functions of main barriers to policy categories (SRQ3).

Barrier in TDF Domains and Sub-domains	Intervention function	Candidate Policy categories	Definition	Evaluation using the APEASE criteria
Goals	Education	Communication/ marketing	Using print, electronic, telephonic or broadcast media.	Yes, the policy can promote disposal knowledge.
		Regulation	Establishing rules or principles of behavior or practice.	Not practicable in this context.
		Service provision	Delivering a service.	Not practicable in this context.
Intentions	Education	Communication/ marketing	(As above)	Yes, the policy can promote knowledge about disposal guidelines and also explain why they are important to follow.
		Regulation	(As above)	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service to induce the use of reuse/recycling channels or stimulate disposal action.
	Persuasion	Communication/ marketing	(As above)	Yes, the policy can promote knowledge about disposal guidelines and also explain why they are important to follow.
		Regulation	(As above)	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service to induce the use of reuse/recycling channels or stimulate disposal action.
	Incentivization	Communication/ marketing	(As above)	Yes, the policy can include communication/marketing to deliver information about rewards from disposal channels.
		Regulation	(As above)	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service for providing rewards.
	Modeling	Communication/ marketing	(As above)	Yes, the policy can include communication/ marketing to engage in disposal practices through examples that people can imitate.
		Service provision	(As above)	Yes, the policy can include service to engage in disposal practices through examples that people can imitate.

Beliefs about consequences (Negative)	Education	Communication/ marketing	(As above)	Yes, the policy can include communication/marketing to induce the use of reuse/recycling channels, or stimulate disposal action.
		Regulation	(As above)	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service to induce the use of reuse/recycling channels or stimulate disposal action.
	Persuasion	Communication/ marketing	(As above)	Yes, the policy can include communication/marketing to induce the use of reuse/recycling channels, or stimulate disposal action.
		Regulation	(As above)	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service to induce the use of reuse/recycling channels or stimulate disposal action.
	Modeling	Communication/ marketing	(As above)	Yes, the policy can include communication/ marketing to engage in disposal practices through examples that people can imitate.
		Service provision	(As above)	Yes, the policy can include service to engage in disposal practices through examples that people can imitate.
Attributes (good condition) of the clothing item	Environmental restructuring	Fiscal measures	Using the tax system to reduce or increase the financial cost.	Yes, the policy can include fiscal measures to reduce the cost of disposal facilities, services, or events.
		Regulation	(As above)	Yes, the policy can include regulations to establish rules or principles of second-hand clothing collection.
		Service provision	(As above)	Yes, the policy can include service to improve the accessibility of clothing disposal resources.
	Enablement	Fiscal measures	(As above)	Yes, the policy can include fiscal measures to reduce the cost of disposal facilities, services, or events, thereby reducing barriers and increasing capability or opportunity.
		Regulation	(As above)	Yes, the policy can include regulations to establish rules or principles of second-hand clothing collection, thereby reducing barriers and increasing capability or opportunity.
		Environmental/social planning	Designing and/ or controlling the physical or social environment	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service to improve the accessibility of clothing disposal resources, thereby increasing opportunity.

Situational factors related to time constraints	Environmental restructuring	Fiscal measures	(As above)	Not practicable in this context.
		Regulation	(As above)	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service to improve the accessibility of clothing disposal resources.
	Enablement	Fiscal measures	(As above)	Not practicable in this context.
		Regulation	(As above)	Not practicable in this context.
		Environmental/social planning	(As above)	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service to improve the accessibility of clothing disposal resources, thereby increasing opportunity.
Availability of wardrobe	Environmental restructuring	Fiscal measures	(As above)	Not practicable in this context.
		Regulation	(As above)	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service to improve the accessibility of clothing disposal resources.
	Enablement	Fiscal measures	(As above)	Not practicable in this context.
		Regulation	(As above)	Not acceptable in this context.
		Environmental/social planning	(As above)	Not practicable in this context.
		Service provision	(As above)	Yes, the policy can include service to improve the accessibility of clothing disposal resources, thereby increasing opportunity.

Table 21. Mapping of identified intervention functions of main facilitators to policy categories (SRQ3).

Barrier in TDF Domains and Sub-domains	Intervention function	Candidate Policy categories	Evaluation using the APEASE criteria
Attributes (damage) of the clothing item	Environmental restructuring	Fiscal measures	Yes, the policy can include fiscal measures to reduce the cost of disposal facilities, services, or events, thereby promote the disposal of clothing, or to provide repair services.
		Regulation	Yes, the policy can include regulations to establish rules or principles of clothing disposal, thereby optimizing facilities and promoting disposal actions.
		Service provision	Yes, the policy can include service to improve the accessibility of clothing disposal resources.
	Enablement	Fiscal measures	Yes, the policy can include fiscal measures to reduce the cost of disposal facilities, services, or events, thereby increasing capability or opportunity.
		Regulation	Yes, the policy can include regulations to establish rules or principles of cloting disposal, thereby increasing capability or opportunity.
		Environmental/social planning	Not practicable in this context.
		Service provision	Yes, the policy can include service to improve the accessibility of clothing disposal resources, thereby increasing opportunity.
Situational factors related to event	Environmental restructuring	Fiscal measures	Not practicable in this context.
		Regulation	Not practicable in this context.
		Service provision	Yes, the policy can include service to improve the accessibility of clothing disposal resources.
	Enablement	Fiscal measures	Not practicable in this context.
		Regulation	Not practicable in this context.
		Environmental/social planning	Not practicable in this context.
		Service provision	Yes, the policy can include service to improve the accessibility of clothing disposal resources, thereby increasing opportunity.
Availability of wardrobe	Environmental restructuring	Fiscal measures	Not practicable in this context.
		Regulation	Not practicable in this context.
		Service provision	Yes, the policy can include service to improve the functions of clothing disposal resources, such as clothing management and disposal.
	Enablement	Fiscal measures	Not practicable in this context.

		Regulation	Not acceptable in this context.
		Environmental/social planning	Not practicable in this context.
		Service provision	Yes, the policy can include service to enhance the functionality of clothing disposal resources, including clothing management and disposal.
Intentions	Education	Guidelines	Not practicable in this context.
		Regulation	Not practicable in this context.
		Service provision	Yes, the policy can include service to induce the use of reuse/recycling channels or stimulate disposal action.
	Incentivization	Communication/ marketing	Yes, the policy can include communication/marketing to deliver information about rewards from disposal channels.
		Regulation	Not practicable in this context.
		Service provision	Yes, the policy can include service for providing rewards, thereby encouraging further clothing disposal actions.
Beliefs about consequences (Positive)	Education	Communication/ marketing	Yes, the policy can include communication/marketing to induce the use of reuse/recycling channels, or stimulate disposal action.
		Regulation	Not practicable in this context.
		Service provision	Yes, the policy can include service to induce the use of reuse/recycling channels or stimulate disposal action.
Social influence	Environmental restructuring	Fiscal measures	Yes, the policy can include fiscal measures to reduce the cost of disposal facilities, services, or events.
		Regulation	Not practicable in this context.
		Service provision	Yes, the policy can include service to offer individuals facilities and service with social activities to encourage clothing disposal, thereby encouraging further disposal actions.
	Enablement	Fiscal measures	Yes, the policy can include fiscal measures to reduce the cost of disposal facilities, services, or events, thereby increasing capability or opportunity.
		Regulation	Not practicable in this context.
		Environmental/social planning	Not practicable in this context.
		Service provision	Yes, the policy can include service to offer individuals facilities and service with social activities, thereby increasing opportunity.

Table 22. Mapping of identified intervention functions of main barriers to policy categories (SRQ4).

Barrier in TDF Domains and Sub-domains	**Intervention function**	**Candidate Policy categories**	**Evaluation using the APEASE criteria**
Knowledge	Education	Communication/ marketing	Yes, the policy can promote knowledge about OCRP's using instruction and its benefits.
		Regulation	Not practicable in this context.
		Service provision	Not practicable in this context.
Situational factors related to disposal channel	Environmental restructuring	Guidelines	Not practicable in this context.
		Fiscal measures	Yes, the policy can include fiscal measures to reduce the cost of OCRP, thereby promote the disposal actions through its utilization.
		Regulation	Yes, the policy can include regulations to establish rules or principles of clothing disposal, thereby optimizing the functions of OCRP and distinguishing it from other channels.
		Service provision	Yes, the intervention can offer individuals convenient functions and service for OCRP.
	Enablement	Fiscal measures	Yes, the policy can include fiscal measures to reduce the cost of OCRP, thereby promote the disposal actions through its utilization.
		Regulation	Yes, the policy can include regulations to establish rules or principles of clothing disposal, thereby reduce barriers and cultivate mental resilience for active engagement in using OCRP.
		Environmental/social planning	Not practicable in this context.
		Service provision	Yes, the intervention can offer individuals convenient functions and service for OCRP.

In summary, for SRQ3, the identified policy categories concerning the barriers include communication/marketing, fiscal measures, regulation, and service provision. The identified policy categories in terms of the facilitators include fiscal measures, regulation, service provision, and communication/marketing. For SRQ4, the identified policy categories concerning the barriers comprise communication/marketing, fiscal measures, regulation, and service provision.

5.2.3 Selection of BCTs

Regarding BCTs for SRQ3, based on the identified intervention functions from the main barrier themes, BCTs were selected by referring to the "most/less frequently used BCTs" lists, consulting their definitions and examples through the BCTTv1 (Michie et al., 2014), and conducting pre-evaluation. Candidate BCTs with corresponding numbers from BCTTv1 were selected for barriers for SRQ3 (see Table 23). Finally, pre-evaluated candidate BCTs were post-evaluated using the APEASE criteria developed by Michie et al. (2014).

Based on the identified intervention functions from the main facilitator themes, BCTs were selected by referring to the "most/less frequently used BCTs" lists, consulting their definitions and examples through the BCTTv1, and conducting pre-evaluation. Candidate BCTs with corresponding numbers from BCTTv1 were selected for facilitators for SRQ3 (see Table 24). These pre-evaluated candidate BCTs were then evaluated using the APEASE criteria.

Regarding BCTs for SRQ4, based on the identified intervention functions from the main barrier themes, BCTs were selected by referring to the "most/less frequently used BCTs" lists, consulting their definitions and examples through the BCTTv1, and conducting pre-evaluation. Candidate BCTs with corresponding numbers from BCTTv1 were selected for barriers for SRQ4 (see Table 25). These pre-evaluated candidate BCTs were then evaluated using the APEASE criteria.

Table 23. Linking of identified intervention functions of main barriers to BCTs (SRQ3).

TDF Domain	Intervention function	Candidate BCTs	Definition	Evaluation using the APEASE criteria
Goals	Education	5.3 Information about social and environmental consequences	Provide information about social and environmental consequences of performing the behavior	Yes, information on disposal channel functions, attributes, and environmental benefits could be provided.
Intentions	Education	5.3 Information about social and environmental consequences	(As above)	Yes, information on environmental benefits could be provided.
	Persuasion	5.3 Information about social and environmental consequences	(As above)	Yes, information on environmental benefits could be provided.
		6.3. Information about other's approval	Draw attention to others' performance to allow comparison with the person's own performance	Yes, information about other's approval on clothing reuse/recycling could be provided.
		9.1 Credible source	Present verbal or visual communication from a credible source in favor of or against the behavior	Yes, presenting credible source to explain the benefits of proper clothing disposal
	Incentivization	10.2 Material reward	Arrange for the delivery of money, vouchers or other valued objectives if and only if there has been effort and/or progress in performing the behavior (includes positive reinforcement)	Yes, arrange for the delivery of vouchers or other valuable items to individuals who use reuse/recycle disposal channels.
	Modeling	6.1 Demonstration of the behavior	Provide an observable sample of the performance of the behavior, directly in person or indirectly.	Yes, provide an observable samples of clothing organization and disposal methods through the use of social media tools.
Beliefs about consequences (Negative)	Education	5.3 Information about social and environmental consequences	(As above)	Yes, information on disposal channel functions, attributes, and environmental benefits could be provided.

	Persuasion	5.3 Information about social and environmental consequences	(As above)	Yes, information on disposal channel functions, attributes, and environmental benefits could be provided.
		6.3. Information about other's approval	(As above)	Yes, present videos or images showcasing citizens disposing of clothing items with diverse attributes.
		9.1 Credible source	(As above)	Yes, present videos or images from role models explaining the advantages and positive outcomes associated with the disposal of unused clothing.
	Modeling	6.1 Demonstration of the behavior	(As above)	Yes, provide an observable samples of clothing organization and disposal methods through the use of social media tools.
Attributes (good condition) of the clothing item	Environmental restructuring	12.1 Restructuring the physical environment	(As above)	Yes, provide second-hand clothing trading, rental, and clothing exchange services, while also establishing convenient and easily accessible clothing disposal sites.
	Enablement	12.1 Restructuring the physical environment	(As above)	Yes, provide second-hand clothing trading, rental, and clothing exchange services, while also establishing convenient and easily accessible clothing disposal sites.
Situational factors related to time constraints	Environmental restructuring	12.1 Restructuring the physical environment	(As above)	Yes, improving the time-saving functions and accessibility of the channels.
	Enablement	12.1 Restructuring the physical environment	(As above)	Yes, improving the time-saving functions and accessibility of the channels, thereby increasing opportunities.
Availability of wardrobe	Environmental restructuring	12.1 Restructuring the physical environment	(As above)	Yes, providing reminders about clothing sorting and disposal.
	Enablement	12.1 Restructuring the physical environment	(As above)	Yes, providing reminders about clothing sorting and disposal.
		1.4 Action planning	Prompt detailed planning of performance of the behavior.	Yes, encouraging prompt planning of clothing organization and disposal.

Table 24. Linking of identified intervention functions of main facilitators to BCTs (SRQ3).

TDF Domain	Intervention function	Candidate BCTs	Evaluation using the APEASE criteria
Attributes (damage) of the clothing item	Environmental restructuring	12.1 Restructuring the physical environment	Yes, provide convenient facilities and service to uphold and promote the disposal of clothing with damage attributes, or to provide repair services.
	Enablement	12.1 Restructuring the physical environment	Yes, provide convenient facilities and service to uphold and promote the disposal of clothing with damage attributes, or to provide repair services, thereby enhancing individuals' positive attitudes towards desired behaviors and cultivating mental resilience for active engagement in them.
Situational factors related to events	Environmental restructuring	12.1 Restructuring the physical environment	Yes, promoting disposal events by cooperating with enterprises and communities.
	Enablement	12.1 Restructuring the physical environment	Yes, promoting disposal events by cooperating with enterprises and communities, thereby enhancing individuals' positive attitudes towards desired behaviors and cultivating mental resilience for active engagement in them.
Availability of wardrobe	Environmental restructuring	12.1 Restructuring the physical environment	Yes, providing reminders about clothing disposal.
	Enablement	1.4 Action planning	Yes, encouraging prompt planning of clothing organization and disposal.
Intentions	Education	5.3 Information about social and environmental consequences	Yes, information on disposal channel functions, attributes for proper disposal could be provided, thereby promote further disposal actions.
	Incentivization	10.2 Material reward	Yes, arrange for the delivery of vouchers or other valuable items to individuals who use reuse/recycle disposal channels.
Beliefs about consequences (positive)	Education	5.3 Information about social and environmental consequences	Yes, information on disposal channel functions, attributes for proper disposal could be provided, thereby promote further disposal actions.
Social influence	Environmental restructuring	12.1 Restructuring the physical environment	Yes, establishing clothing disposal resources with social support activities.
	Enablement	13.1 Identification of self as role model	Yes, inform that one's own behavior may be an example to others by organizing activities to help individuals set a positive example for children and family members.

Table 25. Linking of identified intervention functions of main barriers to BCTs (SRQ4).

TDF Domain	Intervention function	Candidate BCTs	Evaluation using the APEASE criteria
Knowledge	Education	5.3 Information about social and environmental consequences	Yes, providing information on the instructions for using OCRP and highlighting its benefits.
Situational factors related to time constraints	Environmental restructuring	12.1 Restructuring the physical environment	Yes, sharing regional resources, and improving the functions and ease of access of OCRP.
	Enablement	12.1 Restructuring the physical environment	Yes, sharing regional resources, and improving the functions and ease of access of OCRP. thereby increasing capabilities and opportunities.

To summarize, for SRQ3, the selected BCTs (with corresponding numbers from BCTTv1) in terms of the barriers include 1.4 Action planning; 5.3 Information about social and environmental consequences; 6.1 Demonstration of the behavior; 6.3. Information about other's approval; 9.1 Credible source; 10.2 Material reward; and 12.1 Restructuring the physical environment. Regarding de facilitators, the identified BCTs (with corresponding numbers from BCTTv1) include 1.4 Action planning; 5.3 Information about social and environmental consequences; 10.2 Material reward; 12.1 Restructuring the physical environment; and 13.1 Identification of self as role model. For SRQ4, the identified BCTs in terms of the barriers include 5.3 Information about social and environmental consequences; and 12.1 Restructuring the physical environment.

5.2.4 Identification of mode of delivery

Following the BCW framework, researchers are encouraged to explore different modes of delivering interventions to identify the most appropriate approach for the target behavior, population group, and setting (Michie et al., 2014). Considering that sustainable clothing disposal behavior targets groups and populations rather than individuals, both face-to-face (group) and distance-based (population-level) modes of delivery were taken into account (human interaction, broadcast media, online media, outdoor media, and print media). This was done by referring to the "Taxonomy of modes of delivery for intervention functions that involve communication" (Michie et al., 2014).

From the selected BCTs from the main barrier themes for SRQ3, the corresponding candidate modes of delivery were identified (see Table 26). These candidate BCTs were subsequently assessed using the APEASE criteria developed by (Michie et al., 2014).

From the selected BCTs from the main facilitator themes for SRQ3, the corresponding candidate modes of delivery were identified (see Table 27). These candidate BCTs were subsequently assessed using the APEASE criteria.

From the selected BCTs from the main barrier and facilitator themes for SRQ4, the corresponding candidate modes of delivery were identified (see Table 28). These candidate BCTs were subsequently assessed using the APEASE criteria.

Table 26. linking of selected BCTs of main barriers to mode of delivery (SRQ3).

BCTs	Mode of delivery	Does the BCT meet the APEASE criteria?
5.3 Information about social and environmental consequences	Human interaction	No, this mode of delivery may not effective in this context.
	Broadcast media	No, this mode of delivery may not cost-effective in this context.
	Online media	Yes, information about social and environmental consequences could be delivered online (e.g., internet or mobile phone app)
	Outdoor media	No, this mode of delivery may not cost-effective in this context.
	Print media	No, this mode of delivery may not efficient and cost-effective in this context.
6.1 Demonstration of the behavior	Human interaction	Not effective in this context.
	Broadcast media	Not cost-effective for instruction on how to dispose of clothing.
	Online media	Yes, demonstration of the clothing disposal behavior could be delivered online (e.g., internet or mobile phone app).
	Outdoor media	Not cost-effective for providing demonstration of the clothing disposal behavior.
	Print media	Not effective/cost-effective in this context.
6.3. Information about other's approval	Human interaction	Not practicable in this context.
	Broadcast media	Not cost-effective for showcasing citizens disposing of clothing items with diverse attributes.
	Online media	Yes, information about citizens disposing of clothing items with diverse attributes could be effectively delivered online (e.g., internet or mobile phone app).
	Outdoor media	Not effective/cost-effective for showcasing citizens disposing of clothing items with diverse attributes.
	Print media	Not effective/cost-effective in this context.
9.1 Credible source	Human interaction	Not practicable in this context.
	Broadcast media	Not be cost-effective for presenting verbal or visual communication from role models explaining the advantages and positive outcomes associated with the disposal of unused clothing.
	Online media	Yes, information about verbal or visual communication from role models explaining the advantages and positive outcomes associated with the disposal of unused clothing could be effectively delivered online (e.g., internet or mobile phone app).
	Outdoor media	Not be cost-effective for is deliver for presenting verbal or visual communication from role models explaining the

		advantages and positive outcomes associated with the disposal of unused clothing.
	Print media	No, may not effective/ cost-effective in this context.
10.2 Material reward	Human interaction	Yes, material reward for sustainable disposal practice could be delivered through human interaction.
	Broadcast media	Not practicable in this context
	Online media	Yes, material reward for sustainable disposal practices could be delivered through online media (e.g., rewards for online transfer or points for mobile app).
	Outdoor media	Not practicable in this context
	Print media	Not practicable in this context
12.1 Restructuring the physical environment	Human interaction	Not applicable in this context, as the process of restructuring the physical environment does not involve direct interaction with intervention recipients.
	Broadcast media	
	Online media	
	Outdoor media	
	Print media	
1.4 Action planning	Human interaction	Not practicable in this context
	Broadcast media	Not practicable in this context
	Online media	Yes, action plan could be delivered online (e.g., internet or mobile phone app)No- Not practicable in this context
	Outdoor media	Not practicable in this context
	Print media	Not practicable in this context

Table 27. linking of selected BCTs of main facilitators to mode of delivery (SRQ3).

BCTs	Mode of delivery	Does the BCT meet the APEASE criteria?
1.4 Action planning	Human interaction	Not practicable in this context
	Broadcast media	Not practicable in this context
	Online media	Yes, action plan could be delivered online (e.g., internet or mobile phone app)
	Outdoor media	Not practicable in this context
	Print media	Not practicable in this context
5.3 Information about social and environmental consequences	Human interaction	No, this mode of delivery may not effective in this context.
	Broadcast media	Yes, this mode of delivery could effectively promote the social and environmental consequences of sustainable clothing disposal practices.
	Online media	Yes, information about social and environmental consequences could be delivered online (e.g., internet or mobile phone app)
	Outdoor media	Yes, this mode of delivery could effectively promote the social and environmental consequences of sustainable clothing disposal practices.
	Print media	Yes, this mode of delivery could effectively promote the social and environmental consequences of sustainable clothing disposal practices.
10.2 Material reward	Face-to-face (group): human interaction	Yes, material reward for sustainable disposal practice could be delivered through human interaction.
	Broadcast media	Not practicable in this context
	Online media	Yes, material reward for sustainable disposal practices could be delivered through online media (e.g., rewards for online transfer or points for mobile app).
	Outdoor media	Not practicable in this context
	Print media	Not practicable in this context
12.1 Restructuring the physical environment	Face-to-face (group): human interaction	Not applicable in this context, as the process of restructuring the physical environment does not involve direct interaction with intervention recipients.
	Broadcast media	
	Online media	

	Outdoor media	
	Print media	
13.1 Identification of self as role model	Face-to-face (group): human interaction	Yes, activities organized in schools or communities could be delivered through human interaction.
	Broadcast media	Not practicable in this context
	Online media	Not practicable in this context
	Outdoor media	Not practicable in this context
	Print media	Not practicable in this context

Table 28. linking of selected BCTs of main barriers to mode of delivery (SRQ4).

BCTs	Mode of delivery	Does the BCT meet the APEASE criteria?
5.3 Information about social and environmental consequences	Human interaction	No, this mode of delivery may not effective in this context.
	Broadcast media	Yes, this mode of delivery could effectively and extensively promote the environmental consequences of sustainable clothing disposal practices through the utilization of OCRP.
	Online media	Yes, information about environmental consequences through the utilization of OCRP could be delivered online (e.g., internet or mobile phone app)
	Outdoor media	Yes, this mode of delivery could effectively and extensively promote the environmental consequences of sustainable clothing disposal practices through the utilization of OCRP.
	Print media	No, this mode of delivery may not efficient and cost-effective in this context.
12.1 Restructuring the physical environment	Human interaction	Not applicable in this context, as the process of restructuring the physical environment does not involve direct interaction with intervention recipients.
	Broadcast media	
	Online media	
	Outdoor media	
	Print media	

Therefore, for SRQ3, the identified modes of delivery in terms of the barriers include online media and human interaction, corresponding to the specific BCTs. The modes of delivery in terms of the facilitators include online media and human interaction, aligned with the specific BCTs. For SRQ4, the identified modes of delivery in terms of the barriers include online media, broadcast media, and outdoor media. Notably, all the modes of delivery from the "Taxonomy of modes of delivery for intervention functions that involve communication" are not applicable for the BCT of "Restructuring the physical environment", which is associated with the TDF domain of "environment context and resources". This is because the process of restructuring the physical environment does not involve direct interaction with intervention recipients.

5.3 Summary

In conclusion, to achieve ***SRO2*** involved the development of a method for promoting sustainable clothing disposal behavior among generation Y Chinese female consumers based on the identified categorization of behavioral issues. ***Study 2*** conducted a comprehensive 5-step process to identify intervention and implementation options focusing on both barriers and facilitators for unused clothing disposal and the usage of OCRP. These steps included:

Step 1: Identification of barrier and facilitator themes within COM components and TDF domains (and sub-domains).

Step 2: Identification of intervention functions.

Step 3: Identification of policy categories.

Step 4: Selection of BCTs.

Step 5: Identification of mode of delivery.

Tables 29, 30, and 31 present the synthesis of this process. These tables illustrate the relationships among intervention functions, policy categories, BCTs, and modes of delivery in addressing clothing disposal issues.

Table 29. Synthesis of the process for promoting disposal of unused clothing: Addressing barriers.

COM component	**Step 1: TDF Domain(s)/Sub-domain(s)**		**Step 2: Intervention Function(s)**	**Step 3: Policy Category(s)**	**Step 4: BCT(s) (Number in BCTTv1)**	**Step 5: Mode(s) of delivery**
Reflective motivation	Alternative action planning (**Goal**)		• Education	• Communication /marketing • Service provision	5.3 Information about social and environmental contexts 6.1 Demonstration of the behavior 6.3 Information about other's approval 9.1 Credible source 10.2 Material reward	• Online media • Human Interaction (Only for 10.2)
	Intention no to dispose (**Intentions**)		• Education • Persuasion • Incentivization • Modelling			
	Negative outcome expectancies (**Beliefs about consequences**)		• Education • Persuasion • Modelling			
Physical opportunity	**Environmental Context and Resources**	Attributes (good condition) of the clothing item	• Environmental restructuring • Enablement	• Fiscal measures • Regulation • Service provision	12.1 Restructuring the physical environment	Not applicable for component of physical opportunity
		Situational factors related to time constraints		• Service provision		
		Availability of wardrobe			12.1 Restructuring the physical environment 1.4 Action planning	Online media

Table 30. Synthesis of the process for promoting disposal of unused clothing: Addressing facilitators.

Step 1:			**Step 2: Intervention Function(s)**	**Step 3: Policy Category(s)**	**Step 4: BCT(s) (Number in BCTTv1)**	**Step 5: Mode(s) of delivery**
COM component	**TDF Domain(s)/Sub-domain(s)**					
Physical opportunity	**Environmental Context and Resources**	Attributes (damage) of the clothing item	• Environmental restructuring • Enablement	• Fiscal measures • Regulation • Service provision	12.1 Restructuring the physical. environment	Not applicable for component of physical opportunity
		Situational factors related to event				
		Availability of wardrobe		• Service provision	1.4 Action planning	Online media
Reflective motivation	Intention to dispose (**Intentions**)		• Education • Incentivization	• Communication/ marketing • Service provision	5.3 Information about social and environmental contexts 10.2 Material reward	• Online media • Human Interaction (Only for 10.2)
	Positive outcome expectancies (**Beliefs about consequences**)		• Education			
Social opportunity	Social support (**Social influence**)		• Environmental restructuring • Enablement	• Fiscal measures • Service provision	12.1 Restructuring the physical environment 13.1 Identification of self as role model	• Human Interaction (Only for 13.1)

Table 31. Synthesis of the process for promoting OCRP usage: Addressing barriers.

Step 1			Step 2: Intervention Function(s)	Step 3: Policy Category(s)	Step 4: BCT(s) (Number in BCTTv1)	Step 5: Mode(s) of delivery
COM component	**TDF Domain(s)/Sub-domain(s)**					
Psychological capability	Procedural knowledge (**Knowledge**)		Education	Communication/ marketing	5.3 Information about social and environmental contexts	• Online media • Broadcast media • outdoor media
Physical opportunity	**Environment context and resources**	Situational factors related to disposal channel	• Environmental restructuring • Enablement	• Fiscal measures • Regulation • Service provision	12.1 Restructuring the physical environment	Not applicable for component of physical opportunity

Chapter 6. Discussion and Conclusion

6.1 From *Study 1*: Factors influence different types of consumption behaviors

To propose a successful behavioral change intervention for clothing consumption towards environmental sustainability, it is crucial to understand current consumption behavior and the factors that influence them. By categorizing the actual clothing consumption behavior over the phases of purchase, use, and disposal, this study identifies factors affecting sustainable clothing consumption and issues that need to be addressed within each category, as discussed below.

6.1.1 Categorization of clothing consumption behavior of Chinese consumers

Based on the averages of TCI and NAWEI, the behaviors of the 60 participants were categorized as small–active, small–passive, or large–passive. Despite both S-A and S-P having a small amount of TCI, their NAWEIs differed. This indicates that S-A wore certain clothing items frequently and kept a few TCI-2. However, frequent and long-term use could result in clothing damage, indicating the need for clothing repair and maintenance for S-A (Gwilt, 2021). In comparison to S-A, S-P used more of their clothing items and kept fewer TCI-2. As for L-P, they owned a large number of TCI and their clothing items were infrequently worn. L-P also owned significantly more TCI-2 than S-A and S-P based on the results of the one-way ANOVA (Table 11). These findings suggest that L-P owns significantly more clothing items than necessary, indicating that a large number of clothes may need to be disposed of by this category composed of female participants. This aligns with the finding of Zhang et al. (2020), who found that women tend to dispose of more clothing items than men. It is worth noting that no behaviors were categorized as large–active, which could be interpreted as the study excluding populations such as women over 70 years old, who may have accumulated a large number of clothing items but only wear a few items frequently due to reduced participation in social activities.

6.1.2 Factors influence clothing purchase behavior among categories

For the purchase phase, we measured brand preferences, clothing expenditures, the number of new clothing items, and purchase priorities to determine whether the behavior categories followed sustainable clothing purchase behaviors, such as buying high-quality clothing and restricting clothing purchases (Rhee & Johnson, 2019).

In S-A, a behavior category dominated mainly by men and the elderly, budget brands tend to be purchased with lower annual clothing expenditures, and fewer new items purchased this year. The S-P is mainly composed of young people who typically purchase budget brands and casual/middle brands, with medium clothing expenditure, relatively more new items purchased this year, and priority given to fashionable/trendy purchases. The L-P is mainly composed of females aged between 28 and 47 years old, who typically purchase casual/middle brands with higher annual clothing expenditures and more new items purchased this year. This is consistent with the findings that women were more eager to consume clothing associated with femininity (Gupta & Gentry, 2016). A possible explanation for this is that women require more items for a variety of clothing combinations, which would inevitably produce waste. These findings also support those of Rahman et al. (2020), who noted that men were more concerned with functional benefits, corresponding to the attributes of performance and utilitarianism, thus, exhibiting highly efficient clothing use behaviors. Possibly, as age affects the difference between behavior categories, this could be explained by the fact that young Chinese consumers tend to spend more on consumer products than previous generations (Rahman et al., 2020). Older consumers, on the other hand, are less concerned with the visual attributes of clothing and tend to be more concerned with the performance attributes of clothing (Lang et al., 2013). Moreover, as they are less likely to participate in social activities, which leads to owning fewer clothing items. In terms of brand preference, the results support those of Gwozdz et al. (2017), who found that consumers in a segment with low consumption tended to buy clothing items from budget brands, whereas consumers in a segment with medium and high consumption purchased clothing from casual/middle and premium brands. When it comes to clothing quality, L-P demonstrates sustainable characteristics in the purchase of better-quality clothing despite its high TCI and passive NAWEI, while S-A and S-P demonstrate unsustainable traits in the purchase of lower-quality clothing despite their small TCIs. The annual clothing expenditure and number of new items show that the inflow of clothing items is in line with the TCI of S-A and L-P. Fashionable/trendy preferences appear to be a high priority in S-P, supporting the findings of Laitala and Klepp (2020) that fashion-conscious consumers are strongly associated with passive clothing use. However, a small TCI appears to contradict the relatively large clothing inflow shown by S-P. This could be explained by the fact that young consumers, who are primary group consuming fast fashion (Lee et al., 2013; Rahman et al., 2020), tend to purchase a large number of clothing items and dispose of clothing frequently (Lang et al., 2013), despite having smaller TCIs compared to previous generations. S-P's pursuit of fashion and low-frequency wearing also demonstrates the demand for short-term clothing ownership, such as experiential and innovative approaches (renting and swapping) (Armstrong et al., 2015). Therefore, the issues to be addressed regarding categorization toward the purchase phase are improving the quality of clothing purchased for S-A, improving the quality of clothing purchased and reducing the inflow of clothing items for S-P, and reducing the inflow of clothing items for L-P.

6.1.3 Factors influence clothing use behavior among categories

For the use phase, we measured TCI-2, repair experience, and IWHF attributes to determine whether the behavior categories followed sustainable clothing use behaviors, such as limiting the total number of clothing items, improving their usage frequency, and prolonging the clothing use period (Rhee & Johnson, 2019).

S-A has fewer TCI-2 and more experience repairing clothing, their clothing is frequently worn, and they prefer long-life, low-priced bottoms, mostly sports/knitted trousers. S-P has fewer TCI-2 and less experience repairing clothing. Their clothing items are infrequently worn, and they prefer short-duration tops, long-duration bottoms, and low-priced bottoms, mostly jeans and sports/knitted trousers. L-P has a large TCI-2 and relatively more experience repairing clothing. They wear clothing infrequently and prefer short-lived tops. As shown in the findings, TCI-2 is in line with the TCI; namely, the participants in the category own a large number of TCIs and also a large number of unused items. Surprisingly, TCI-2 (N = 1470) accounted for almost half of the TCI (N = 3084) in this study, and L-P contributed more to TCI-2 (N = 857). This finding supports that of Fletcher (2012), who found that a large number of purchases led to increased clothing ownership and storage. In terms of usage frequency, S-P and L-P exhibit lower wearing frequency, which also affects the lifespan of the clothing (Laitala & Klepp, 2020). Regarding the repair experience, S-A demonstrated sustainable performance, which could prolong the clothing use period, followed by L-P. This supports the findings by Laitala and Klepp (2018) and Gwilt (2014) that repairs are more frequent among older consumers with more skills. L-P participants preferred non-budget brands and spent more on clothing, which is consistent with Degenstein et al. (2020), who found that participants' willingness to engage in repair is influenced by the initial cost of the garment. As for the attributes of the IWHF, even though the outerwear attributes do not exhibit significant differences, some attributes of the bottoms and tops can be used to determine the use habits of each category. Participants in S-A can frequently wear bottoms that last more than three years, followed by those in S-P, which shows their potential to prolong the life of bottoms and use them frequently. Participants in the S-P wore tops for a shorter duration (less than one year), which aligns with the category's value for fashionable/trendy use. S-A and S-P prefer low-priced bottoms and primarily sports/knitted trousers, which is consistent with their preference for budget brands. In addition, participants in the L-P preferred jeans as their most frequently worn bottoms, followed by the S-P. However, most jeans have high environmental impacts during the production process of dyeing and washing as well as during the maintenance phase, although some brands adopt sustainable production methods (Muthu, 2017). Therefore, the following issues need to be addressed regarding the categorization toward the use phase: reducing the TCI-2 for L-P; improving the frequency of usage for S-P and L-P; improving clothing repair capability and awareness for S-P; and optimizing the choice of jeans brands or providing alternatives for L-P and S-P.

6.1.4 Factors influence clothing disposal behavior among categories

For the disposal phase, we measured disposal reasons, disposal channels, and disposal quantity to determine whether the behavior categories followed sustainable clothing disposal behaviors, such as disposing of clothing items in a manner that limits the amount of waste entering landfill (Rhee & Johnson, 2019).

Notably, the OCRP has emerged in China in recent years as one of the most promising clothing recycling platforms, providing online booking and offline free door-to-door pick-up services (Spuijbroek, 2019; Zhang et al., 2020). However, only four participants selected this channel, and the Fisher's exact test results were not significant ($p = 0.056$), indicating that it has not been widely accepted by consumers. Interestingly, all four participants were from L-P, which indicates that L-P, unlike other categories, has the potential to use OCRP disposal channels in addition to the conventional channels of reuse and recycling.

S-A disposes of fewer items each year, using conventional and online sustainable disposal channels less, and throws away unwanted clothing items more. S-P disposes of clothing items for psychological reasons, using conventional disposal channels of reuse/recycling, throwing away unwanted clothing items relatively more, and disposing of medium amounts each year. L-P disposes of clothing items for psychological reasons, using conventional disposal channels of reuse/recycling, and disposing of clothing items in a larger number each year. These findings are consistent with those of previous studies (Laitala & Klepp, 2015; Zhang et al., 2020), which found that women are fashion-oriented, making them dispose of clothing items more frequently than men. While L-P disposal quantities are large, considering the large number of TCI-2s they own, it indicates that they still have many clothing items that are potential candidates for disposal. Psychology is a common reason for disposing of clothes, including fashion and boredom concerns (Degenstein et al., 2021; Guo & Kim, 2021; Laitala, 2014). The S-P and L-P selected psychological reasons that were in line with their fashion and variable-style pursuit characteristics. In terms of disposal channels, both L-P and S-P indicate better performance when using conventional reuse or recycling channels, which can prolong the lifespan of unwanted clothing items with psychological disposal reasons. In contrast, S-A performs poorly when picking the reuse and recycling channels instead of opting for the throwing away channel, indicating that they may face difficulties in disposing of unwanted clothing owing to physical issues, despite their capacity to use clothing for an extended lifespan. Meanwhile, the fact that S-P also contributes more to the throw-away channel suggests that they may encounter difficulties in disposing of unwanted fast fashion items. Therefore, the issues to be addressed in the disposal phase include improving the disposal channel of OCRP for all three categories, improving the disposal quantity of TCI-2 (outflow of clothing items) for L-P, and enhancing the awareness and capability of clothing reuse and recycling for S-A and S-P.

6.1.5 Summary of the issues need to be addressed among categories

While based on a small sample size of the Chinese population, this study describes consumers' actual clothing consumption behaviors during a designated time period through an observation of daily photograph logs and a wardrobe survey. It reveals details about variations in clothing consumption behavior among three behavior types by considering the total number of clothing items (used and unused) and the usage frequency for tops, outerwear, and bottoms. The factors for sustainable clothing consumption behavior across the purchase, use, and disposal phases were examined between behavior categories. The results show that gender, age, brand preference, annual expenditure on clothing, the number of new clothing items, purchase priorities, disposal reason, disposal channels, disposal quantity, repair experience this year, duration of use, price, and clothing type are factors that influence the different consumption behaviors of Chinese consumers.

As a result of behavior categorization towards environmental sustainability, the following issues need to be addressed as shown in Table 32:

(1) For S-A, improving the quality of purchased clothing, promoting the usage of the disposal channel OCRP and enhancing clothing reuse and recycling capacity and awareness.

(2) For S-P, improving the quality of purchase clothing, reducing the inflow of clothing items, improving the usage frequency, improving the capability and awareness of clothing repairing, optimizing the choice of jeans brands or providing alternative bottoms, promoting the usage of the OCRP, and enhancing awareness and capability of clothing reuse and recycling.

(3) For L-P, reducing the inflow of clothing items, reducing the quantity of unused clothing items, improving the usage frequency, optimizing the choice of jeans brands or providing alternatives, promoting the usage of the OCRP, and improving the disposal quantity of TCI-2.

Table 32. Issues that need to be addressed in behavior categorization for environmental sustainability.

Categorization	Purchase phase	Use phase	Disposal phase
S-A	• improving the quality of purchased clothing	–	• Promoting the usage of the disposal channel OCRP • Enhancing clothing reuse and recycling capacity and awareness
S-P	• Improving the quality of purchase clothing • Reducing the inflow of clothing items	• Improving the usage frequency • improving the capability and awareness of clothing repairing • optimizing the choice of jeans brands or providing alternatives	• Promoting the usage of the disposal channel OCRP • Enhancing clothing reuse and recycling capacity and awareness
L-P	• Reducing the inflow of clothing items	• Reducing the quantity of unused clothing items • Improving the usage frequency • optimizing the choice of jeans brands or providing alternatives	• Promoting the usage of the OCRP • Improving the disposal quantity of TCI-2

These findings highlight the importance of developing targeted interventions for sustainable clothing consumption behaviors based on the specific characteristics of different consumer categories. The following chapter delves into a detailed intervention based on the disposal issues of L-P, representing the broader findings, and provides recommendations for policymaker and relevant stakeholders to promote sustainable clothing disposal behaviors in China.

6.1.6 Further implications from *Study 1*

The insights from ***Study 1*** provide a comprehensive understanding of clothing consumption, including variations in different phases of clothing consumption, within the context of environmental sustainability. The findings also provide a foundation for developing interventions to promote behavioral change. ***Study 1*** categorizes Chinese consumers based on their actual usage number of clothing items and the frequency of use over a specific period. By examining the factors that influence clothing consumption behavior in each category, the study identifies the environmental issues that need to be addressed in purchase, use and disposal phases of clothing consumption. This highlights the importance of taking a holistic approach to sustainable clothing consumption, addressing the entire lifecycle from purchase to use to disposal. The research contributes to the growing body of knowledge on sustainable consumption and provides practical insights for promoting sustainable

clothing consumption behavior in China. Furthermore, while the empirical evidence gathered primarily focuses on clothing consumption, the methodology and findings have broader implications for product consumption in other fields. The study's emphasis on consumer categorization and the influence of factors throughout the consumption phases, rather than relying solely on specialized knowledge in the clothing sector, allows for the transferability of the study design to diverse industries. Additionally, the study design offers valuable insights that can inform sustainable consumption practices globally, fostering a more sustainable future across countries and regions.

The implications of these findings are significant. Firstly, they provide valuable insights for policymakers regarding variations in clothing consumption. Policymakers can use these insights to develop effective strategies for promoting sustainable clothing consumption practices. The categorized clothing consumption behaviors (small-active, small-passive, and large-passive) can serve as a basis for designing targeted interventions. Recognizing the diversity in consumer behaviors allows policymakers to tailor their strategies to address the specific needs and challenges of each category. For instance, small-active consumers may require support in maintaining their sustainable practices, while large-passive consumers may need more encouragement to adopt sustainable disposal behaviors. Policymakers can encourage collaboration between government agencies, industry stakeholders, and consumer advocacy groups to develop and implement sustainable clothing standards and regulations. This can include enforcing quality requirements for clothing, promoting recycling programs, establishing collection points for clothing reuse or recycling, and incentivizing sustainable clothing consumption practices.

Educators can incorporate the findings of this study into their curriculum to raise awareness among students about sustainable clothing consumption. They can educate students about the identified factors and their impact on sustainable clothing choices. By promoting sustainable fashion education, educators can foster a sense of responsibility and consciousness among future consumers, encouraging them to make informed choices regarding their clothing consumption. Given the influence of factors such as brand preference, purchase priorities, and disposal reasons on clothing consumption behaviors, educators can prioritize educational campaigns and awareness programs that promote sustainable clothing production and consumption practices.

For stakeholders in the clothing industry, this study also provides recommendations. Understanding the influence of demographic factors such as gender and age can help tailor marketing campaigns and product offerings to specific consumer categories. Similarly, insights into brand preferences and purchase priorities can inform the development of sustainable fashion brands and products that align with consumer values and preferences. Based on the findings of this study, retailers may need to collaborate with manufacturers and recyclers to develop a long-term relationship with consumers, and provide a variety of services tailored to different

consumer categories. For instance, repair and maintenance services are suitable for S-A consumers, rental and swapping services are suitable for S-P, and take-back services are suitable for L-P. Manufacturers can also benefit by producing higher-quality clothing items that facilitate long-term use or reuse patterns.

Consumers can benefit from the study by gaining insights into their own clothing consumption behavior and its environmental impact. They can evaluate their preferences and habits in light of the identified factors and make conscious choices to align with sustainable clothing consumption practices. Additionally, understanding the factors related to sustainable clothing consumption can help consumers regulate the quantity of clothing items they own, consider the durability and longevity of clothing items, and make informed decisions about clothing disposal and recycling.

For society as a whole, this research emphasizes the importance of shifting towards sustainable clothing consumption behavior for the benefit of the environment and society as a whole. By adopting sustainable clothing consumption practices, individuals can contribute to reducing the environmental footprint of the clothing industry, mitigating waste generation, and conserving resources.

Overall, the implications of this research extend to policymakers, educators, stakeholders in the clothing industry, consumers, and society at large. By understanding the factors influencing sustainable clothing consumption behavior, these various stakeholders can work together to promote more environmentally friendly practices in the clothing industry and create a more sustainable future.

6.2 From *Study 2*: Development of a procedural method for promoting sustainable clothing disposal behavior among female Chinese consumers from generation Y - Case study

Through the combination of qualitative and quantitative approaches, this case study provides valuable insights into the formulation of a comprehensive 5-step process designed to promote sustainable clothing disposal behavior based on the issues related to disposal behavior of unused clothing items and the usage of OCRP, within the demographic of Generation Y female Chinese consumers, as identified in ***Study 1***.

The initial phase involved the identification of barrier and facilitator themes using the TDF domains and COM components. Subsequently, the main barriers and facilitators were identified through a statistical comparison of the involved COM components. Notably, the themes linked to the primary barriers and facilitators within the TDF domain of “Environmental context and resources” underwent further refinement, incorporating insights from relevant literature and the specific context of clothing disposal.

Furthermore, the study demonstrates the effectiveness of employing the BCW framework in presenting a systematic progression of intervention and implementation

options. These options contain a spectrum of elements, including intervention functions, policy categories, BCTs, and modes of delivery, meticulously outlined step by step. The overarching objective of these options is to promote changes in clothing disposal behaviors, with a specific focus on addressing the issues related to the disposal behavior of unused clothing items and the usage of OCRP among female Chinese consumers from Generation Y.

The outcome of the intervention and implementation options can assist policymakers and relevant stakeholders in developing strategies to enhance consumers' awareness of the environmental impact of their clothing disposal behavior, particularly in the context of China facing the challenge of peak CO2 emissions and striving for carbon neutrality.

6.2.1 Insights from the case study: Development of a procedural method for promoting sustainable clothing disposal behavior

Based on the identified barrier and facilitator themes derived from participant responses and using COM components and TDF domains, the main barriers and facilitators to clothing disposal for unused clothing items (SRQ1) were determined. The main barriers included alternative action planning, lack of intention to dispose, negative outcome expectancies, attributes (good condition) of the clothing items, situational factors related to time constraints, and availability of wardrobe. Conversely, the main facilitators included attributes (damage) of the clothing items, situational factors related to events, and availability of wardrobe, intention to disposal, positive outcome expectancies, and social support. Meanwhile, the main barriers to the usage of OCRP (SRQ2) were identified, including procedural knowledge and situational factors related to disposal channels.

From these identified main barriers and facilitators, intervention and implementation options were identified and selected. For options aiming at addressing barriers to promote the disposal for unused clothing items (SRQ3), the identified intervention functions included education, persuasion, incentivization, modeling, environmental restructuring, and enablement. The identified policy categories included communication/marketing, persuasion; service provision, fiscal measures, and regulation. The selected BCTs comprised 5.3 Information about social and environmental consequences, 6.1 Demonstration of the behavior, 6.3 Information about other's approval, 9.1 Credible source; 10.2 Material reward, 12.1 Restructuring the physical environment, 13.1 Identification of self as role model, and 1.4 Action planning. The modes of delivery identified were online media and human interaction.

In the context of options targeting facilitators to promote the disposal of unused clothing items (SRQ3), the identified intervention functions included environmental restructuring, enablement, education, and incentivization. The policy categories comprised fiscal measures, regulation, service provision, and communication/marketing. The selected BCTs included 12.1 Restructuring the

physical environment, 1.4 Action planning, 5.3 Information about social and environmental consequences, and 10.2 Material reward. The modes of delivery identified were online media and human interaction.

For options targeting barriers to promote the usage of OCRP (SRQ4), the identified intervention functions included education, environmental restructuring, and enablement. The policy categories included communication/marketing, fiscal measures, regulation, and service provision. The selected BCTs include 5.3 Information about social and environmental consequences and 12.1 Restructuring the physical environment. The identified modes of delivery identified included online media, broadcast media, outdoor media and human interaction.

The identification of options for barriers aimed to reduce hindrances and enhance behavior, while options for facilitators aimed to uphold and promote favorable factors. Notably, even though the same BCTs were selected across different barrier and facilitator contexts, they were adapted to specifically address the barriers and facilitators within the clothing disposal context. For instance, the BCT of "12.1 Restructuring the physical environment" was selected for both barrier and facilitator contexts to promote the disposal for unused clothing items. It was transformed into "Implementing tax incentives for disposal platforms, including second-hand clothing trading, rental, and clothing exchange services, and improving the functions and ease of access of the channels" within the sub-domain of attributes (good condition) of the clothing item related to barrier theme. However, it was transformed into "Implementing tax incentives for disposal platforms, and refining and integrating the integrate the disposal channels with similar functions, and establishing convenient repair sites" with the sub-domain of attributes (damage) of the clothing item related to barrier theme.

A comprehensive discussion of the development of the method process for promoting sustainable clothing disposal behavior based on barriers and facilitators for unused clothing items and the usage of OCRP is presented in the following sections.

Insights based on the barriers to clothing disposal for unused clothing items

The study findings indicate that the main barriers to clothing disposal for unused clothing items were alternative action planning, intention not to dispose, negative outcome expectancies, attributes (good condition) of the clothing items, situational factors related to time constraints, and availability of wardrobe.

Alternative action planning (Goal domain in TDF) was a significant barrier for participants chose not to dispose of the unused clothing. Their action plans, such as keeping clothing for their children, waiting for outdated items to come back into fashion, or using them as a home clothing in the future, reflect behaviors aligned with sustainable clothing use as they aim to prolong the lifespan of the garments (Rhee & Johnson, 2019). However, it is important to note that in this study, these clothing items remained unused for an entire year, indicating passive storage until the participants' goals were achieved, which also reflect behaviors aligned with

unsustainable clothing use (Laitala & Klepp, 2015). Therefore, to promote consumers' cognitive awareness of the environmental sustainability benefits of clothing disposal and to help individuals in balancing their current action planning with the available channels, it is necessary to provide education through efficient/cost-efficient media. This education should focus on striking a better balance between individual' goals and options for reuse/recycling disposal. Accordingly, communication/marketing was identified as the corresponding policy category, and the specific BCT of providing information about social and environmental consequences (BCT 5.3) was selected for effective intervention content. Given the defined policy category of communication/marketing, online media, such as internet and mobile phone app (Michie et al., 2014) can be used to help individuals make reasonable judgments between their action plans and specific processing channel decisions. This involves providing information about the functions related to each disposal channel, guidance on making appropriate choices based on the attributes of their unwanted clothing items, and awareness of the environmental sustainability benefits associated with those choices.

Participants mentioned laziness or reluctance as reasons for not disposing of unused clothing (intention domain). Despite being aware of the environment benefits associated with proper clothing disposal, their environmental motivation was not strong enough to overcome these barriers, which is consistent with the findings of Gainforth et al.'s (2016). Based on the guidance of BCW and the evaluation of APEASE criteria, education, persuasion, incentivization, and modeling were selected as intervention functions for the intention domain. Accordingly, communication/marketing was identified as the corresponding policy category, and specific BCTs, including 5.3 Information about social and environmental consequences, 6.1 Demonstration of the behavior, 6.3. Information about other's approval, 9.1 Credible source, and 10.2 Material reward were selected for effective intervention content. Thus, providing information about the environmental benefits could effectively stimulate consumers' engagement in disposal actions (BCT 5.3). Additionally, demonstrating model behavior, exemplified by influencers' showcasing their clothing disposal experiences through various social media platforms (BCT 6.1), can serve as a potent source of inspiration for individuals to embrace responsible clothing disposal practices (Rahman et al., 2020). This effect can be amplified by presenting engaging videos or images depicting everyday individuals responsibly discarding clothing items with different attributes (BCT 6.3). Moreover, leveraging the credibility of role models who articulate the advantages and positive outcomes linked with proper clothing disposal (BCT 9.1) can firmly establish individuals' motivation to translate their intentions into actual disposal behaviors (Tudor et al., 2007). Furthermore, arranging material rewards such as the delivery of vouchers or other valuable items (BCT 10.2) can incentivize individuals to take the initiative in clothing disposal practice (Joung & Park-Poaps, 2013).

In terms of negative outcome expectancies (belief of consequence domain), some participants refrained from disposal due to concerns about consequences, which

is consistent with previous studies by Laitala and Klepp (2018) and Zhang and Hale (2022). Accordingly, education, persuasion, and modeling were identified as functions to include in subsequent interventions. Communication/marketing was also identified as the corresponding policy category, and specific BCTs, including 5.3 Information about social and environmental consequences; 6.1 Demonstration of the behavior; 6.3. Information about other's approval; and 9.1 Credible source were selected for intervention content. By providing information on disposal channel functions, attributes, and environmental benefits, individuals' awareness could be heightened, while their beliefs about disposal could be strengthened. Demonstrating model behavior, exemplified by influencers sharing their clothing disposal experiences through social media tools (BCT 6.1), can further inspire individuals to adopt appropriate clothing disposal practices (Rahman et al., 2020). Displaying videos or images depicting citizens responsibly discarding clothing items with diverse attributes (BCT 6.3) and presenting credible sources, such as role models elucidating the advantages and positive outcomes associated with proper clothing disposal (BCT 9.1), can establish individuals' confidence in the consequences of clothing disposal, thereby reshaping their negative beliefs. These findings resonate with a previous study, emphasizing that reinforcing beliefs in the benefits of sustainable actions and witnessing group members engaging in environmentally friendly practices are pivotal factors fostering individual participation in sustainability initiatives (Tudor et al., 2007).

Given the defined mode of delivery for the above three barriers, using online media, such as internet and mobile phone app (Michie et al., 2014), implementation contents (BCTs) could be effective delivered. This aligns with the finding that media interventions can enhance individuals' understanding of the environmental impact of the textile and clothing industry, thereby encouraging them to make informed decisions and engage in sustainable consumption practices (Baytar & Ashdown, 2014). Various social media platforms in China, including WeChat, Sina Weibo, Little Red Book, WeChat Official Account, TikTok, and Taobao Live Streaming, can also be utilized to disseminate information and promote sustainable disposal practices (Rahman et al., 2020).

Additionally, within the TDF domain of environment context and resources, the findings also reveal that several factors align with sub-domains of attributes (good condition) of the clothing item, situational factors related to time constraints, and availability of wardrobe. These factors emerged as the main barriers to the disposal of unused clothing. This underscores the importance of addressing these barriers within the TDF domain of environmental context and resources, where the crucial intervention functions are environmental restructuring and enablement. Accordingly, service provision was identified as the main corresponding policy category. To enact effective intervention, the BCT of restructuring the physical environment (BCT 12.1) was selected. Notably, since these sub-domains have been refined to discern distinct intervention and implementation options for diverse contexts and resources related to clothing disposal, these options were determined separately within each sub-domain.

The attributes (good condition) of the clothing items, were found to have a significant impact on clothing disposal behavior, which aligns with previous research (Domina & Koch, 2002; Laitala, 2014). Barriers identified in relation to the disposal of unused clothing included perceived quality or high cost of the items, consistent with findings indicating that consumers tend to retain expensive clothing items for extended periods, even if they are no longer being worn (Bianchi & Birtwistle, 2010; Birtwistle & Moore, 2007; Morgan & Birtwistle, 2009). Therefore, to promote the resources of disposal of unused clothing items with good quality, implementing tax incentives for disposal platforms, including second-hand clothing trading, rental, and clothing exchange services, and improving the functions and ease of access of the channels could be effective. This could involve incorporating additional policy categories of fiscal measures and regulation. Such measures would enable individuals to access efficient second-hand clothing trading, rental, and exchange services, (Laitala, 2014), especially considering the limited second-hand trading resources in China (Xu et al., 2014). These initiatives require systemtic management, including processes such as cleaning and disinfection, classification, quality appraisal, pricing, and supervision. With policy support, these processes can be made more cost-effective. By establishing rules or principles of clothing disposal practices, policymakers can strengthen their supervision of disposal channels and integrate them with similar functions. This approach fosters an efficient and reliable clothing disposal environment.

In terms of time constraints, some participants mentioned did not have enough time to properly dispose of clothing items. This main barrier consistent with the study by Laitala and Boks (2012), which highlighted the insufficiency of time as a primary obstacle in addressing clothing-related concerns. Addressing this barrier requires strategic interventions to streamline the disposal process and make it more time-efficient for individuals. One approach could involve enhancing disposal facilities and channels to provide time-saving functions and improved accessibility. By incorporating (BCT 12.1) through service provision and enablement, the aim would be to simplify the steps involved in clothing disposal and make it a more convenient task for individuals with busy schedules. The concept of ease of use of facilities plays a crucial role here. The study by Zhang et al. (2020) underlines how perceived ease of use significantly influences consumers' intentions to engage in disposal behaviors. By ensuring that disposal channels are designed with user-friendliness and efficiency in mind, individuals could be more likely to overcome the time-related barriers and participate in sustainable clothing disposal practices.

Adequate wardrobe availability emerged as another barrier to the disposal of unused clothing items. This could indicate that individuals might possess substantial wardrobe space, yet lack the awareness or inclination to effectively manage their unused clothing. To effectively address this barrier, a combination of BCTs can be employed. One such technique is the application of "Restructuring the physical environment" (BCT 12.1). By strategically organizing wardrobe spaces, individuals can be encouraged to allocate specific areas for unused clothing, making it more

apparent and reminding them of the need for timely disposal. Additionally, the BCT of "Action planning" (BCT 1.4) plays an important role. Providing individuals with gentle reminders regarding clothing sorting and disposal can nudge them toward proactive organization. This could involve periodic notifications, prompting individuals to evaluate their wardrobe and consider the items that need to be let go of. However, the intervention should not stop at reminders alone. Encouraging individuals to engage in prompt planning of clothing organization and disposal is equally crucial. By prompting them to chart out a clothing organization and disposal schedule, a sense of responsibility and purpose can be instilled, thereby transforming their wardrobes from repositories of unused items into reservoirs of conscious consumer behavior.

Insights based on the facilitators to clothing disposal for unused clothing items

The study findings indicate that the main facilitators of clothing disposal for unused clothing items were the attributes (damage) of the clothing items, situational factors related to events, availability of wardrobe, intention to disposal, positive outcome expectancies, and social support.

Interestingly, in contrast to the factors related to environment context and resources within the barrier context, factors aligned with sub-domains of attributes (damage) of the clothing item, situational factors related to events, and availability of wardrobe emerged as the main facilitators for disposing of unused clothing. Similarly, environmental restructuring and enablement were identified as the essential intervention functions, service provision was identified as the main corresponding policy category. These factors seemed to play an important role in encouraging clothing disposal. This underscores the significance of environmental restructuring and enablement as crucial intervention functions. Moreover, the essential role of service provision was also highlighted, making it the main corresponding policy category. In addressing these facilitators, the BCT of restructuring the physical environment (BCT 12.1) was selected for effective intervention content. This technique involves creating an environment that promotes and reinforces desired behaviors, in this case, facilitating the disposal of unused clothing items. It is important to emphasize that the implementation approach was tailored to suit the unique aspects of each sub-domain, ensuring a comprehensive and effective intervention strategy for promoting clothing disposal.

The attributes (damage) of the clothing items were found to facilitate clothing disposal behavior, which aligns with the study of Degenstein et al. (2020). Their research revealed that damaged clothing is more likely to be disposed of. Consequently, to uphold consumers disposal actions, the implementation of tax incentives for disposal platforms, along with the refinement and integration of these disposal channels with similar functions through the inclusion of additional policy categories such as fiscal measures and regulation, could significantly assist individuals in identifying appropriate methods for disposing of damaged clothing. Conversely, this facilitator factor could also imply that individuals lack of repair skills

and awareness when it comes to damaged clothing items. By introducing tax incentives, convenient repair sites could be established, effectively extending the lifespan of individuals' damaged clothing items, as highlighted by the findings of Zhang and Hale (2022). Furthermore, the establishment of definitive rules or principles for clothing disposal practices would enable policymakers to promote the seamless integration of disposal channels. This strategic integration would contribute to the creation of an efficient and dependable clothing disposal environment, benefiting both individuals and the larger community.

In terms of salient events, some participants mentioned occurrences like moving or thorough house cleaning as catalysts for their disposal behavior. This finding correlates with research conducted by Hibbert et al. (2005) and Jacoby et al. (1977), underlining the influence of specific life events on disposal decisions. This underscores the importance of proactively creating such events through targeted environmental restructuring (Hibbert et al., 2005). Consequently, an effective approach to leverage these findings would involve the promotion of disposal-oriented events in collaboration with enterprises and communities (BCT 12.1). A prime example of this could be the organization of community-driven clothing disposal events, drawing inspiration from the work of Joung & Park-Poaps (2013). Such events not only facilitate clothing disposal but also foster a sense of collective engagement and responsibility toward sustainable practices.

The findings reveal that storage space limitations play a role in facilitating clothing disposal behavior, which aligns with Laitala's research (2014). This influence of storage space constraints on clothing disposal behavior underscores the dynamic nature of storage systems, such as wardrobes. These systems are subject to a complex interplay of "push" and "pull" factors that govern the ebb and flow of clothing items (Klepp & Bjerck, 2014). Interestingly, while confined wardrobe space may encourage clothing disposal, it also raises the possibility that individuals might lack the organizational capacity to manage their wardrobes effectively. This challenge could potentially be mitigated through the implementation of wardrobe organizing services (BCT 12.1). By leveraging such services, individuals can unlock the full potential of their wardrobe space, empowering them to make astute decisions about clothing disposal based on a well-organized inventory. This approach not only addresses the immediate concern of efficient wardrobe utilization but also fosters a more thoughtful and rational approach to clothing disposal. By providing the necessary tools and support, individuals can transition from a place of uncertainty and clutter to one of deliberate and conscious consumer behavior.

The intention to dispose emerged as a facilitator for unused clothing disposal (intention domain). According to the findings, the intervention functions of education and incentivization were pinpointed, while communication/marketing and service provision were determined as the corresponding policy categories. This facilitator for disposal of unused clothing indicated individuals indeed possess the motivation to dispose of their clothing items. To uphold and encourage this inclination, targeted

efforts can be employed. One effective approach involves delivering information about disposal channel functions and attributes for proper disposal (BCT 5.3) through online media platforms. By utilizing online channels, this strategy ensures widespread dissemination of knowledge. Furthermore, material rewards such as vouchers or rewards for online transfer or points for mobile app (BCT 10.2) through both online media and human interaction could be organized. This not only capitalizes on the power of online engagement but also harnesses the influence of direct human engagement. By using these strategies, the intention to dispose can be turned into concrete actions, effectively aligning with individuals' positive outcome expectancies and motivating them towards sustained disposal behaviors.

In terms of positive outcome expectancies (belief of consequence domain), some participants disposed of clothing in anticipation of benefits, which is consistent with previous studies by Laitala and Klepp (2018) and Zhang and Hale (2022). Consequently, education and incentivization were identified as functions to include in subsequent interventions. Communication/marketing and service provision were identified as the corresponding policy category. From these, specific BCTs, including 5.3 Information about social and environmental consequences, was selected for intervention content. This facilitator for disposal of unused clothing indicates that individuals hold positive expectations for a portion of their wardrobe. To uphold this and encourage continued action, it is essential to effectively communicate the functions of disposal channels and the proper attributes for item disposal (BCT 5.3). Leveraging online media platforms for this purpose can play a significant role, providing accessible and widespread information. By employing these strategies, the foundation of positive outcomes and expectations related to clothing disposal can be strengthened, ultimately motivating individuals to take further steps in aligning their actions with their intentions.

Regarding social support, it is evident that social support (social influence domain) facilitated disposal of unused clothing. Participants mentioned that the encouragement and acceptance of relatives and friends, as well as engaging in social recycling activities, played a significant role in successfully disposing of their clothing. These findings align with Hanson's study (1980), which also identified social influence as a key factor in promoting disposal activities. Consequently, for subsequent interventions, the importance of environmental restructuring and enablement becomes clear. Additionally, fiscal measures and service provision were identified as corresponding policy categories. Specifically, the chosen BCTs for intervention include 12.1 Changing the environment and 13.1 Identifying self as a role model. Government-supported clothing disposal initiatives, organized in collaboration with stakeholders, in places like communities or shopping malls, can offer accessible and trustworthy resources for clothing disposal (Joung & Park-Poaps, 2013; Ryttinger & Holtmaat, 2014) (BCT 12.1). For instance, France's implementation of extended producer responsibility has effectively encouraged the establishment of recycling and textile disposal programs with financial backing. This effort fostered cooperation among fashion retailers, local communities, collection point organizers,

and recycling entities, leading to significant progress (Bukhari et al., 2018). Furthermore, conducting educational activities in schools or communities can play a vital role in raising awareness about proper clothing disposal and setting positive examples, particularly for female individuals from Generation Y who often play a significant role in family life. This aligns with the understanding that disposal practices are influenced by "role models and family patterns" (Albinsson & Perera, 2009). Such activities can contribute to creating a culture of responsible clothing disposal, with the potential to have a lasting impact on future generations.

Insights based on the barriers to the usage of OCRP for clothing disposal

The findings of the study shed light on the main barriers to the usage of OCRP for clothing disposal. These barriers mainly revolve around procedural knowledge and situational factors associated with disposal channels.

Concerning the lack of knowledge about OCRP, it highlights the significance of personal capability, particularly the specific knowledge and memory required for particularly actions, in shaping behavior (Stern, 2000). To address this barrier, a widespread educational intervention function is imperative within the communication/marketing policy category. Various channels such as print, electronic, telephonic or broadcast media can be utilized to enhance individuals' understanding of OCRP (Michie et al., 2014), including its procedures, disposal pathways, and environmental benefits (BCT 5.3). Given that television and radio serve as efficient means for accessing public service information (Ajilore et al., 2017), leveraging these platforms can substantially enhance knowledge and raise awareness about OCRP. By enhancing understanding and promoting widespread awareness of OCRP, a higher adoption and usage of this practice can be stimulated.

Regarding the barriers to the usage of OCRP, the inconvenience associated with the practice, such as weight limitations and complicated procedures, along with the convenience of alternative disposal channels, were found to influence consumers' decision not to use OCRP. This is in line with the findings of Zhang et al. (2020), who found that a perception of low ease of use reduces consumers' intentions to engage with such platforms. These findings suggest that addressing environmental context and resource-related issues necessitates active involvement from the clothing industry and government, extending beyond individual competence and motivation enhancement. Implementing environmental restructuring and enablement intervention functions by the clothing industry and government, as proposed by Zhang and Hale (2022), emerges as pivotal in this context. Structural and policy change plays a vital role in embedding and supporting behavioral change. Consequently, environmental restructuring and enablement stand out as indispensable functions for subsequent interventions, while service provision, regulation, and fiscal measures emerge as pertinent policy categories. Specifically, the adoption of the BCT involving restructuring the physical environment (BCT 12.1) is recommended for intervention content. In order to attract consumers towards OCRP usage, adjustments to the platform's user-friendliness through resource restructuring, such as relaxing

restrictions on old clothing weight via communal resource sharing or partnerships with community organizations, are necessary. By establishing a set of rules or guidelines governing OCRP practices, policymakers can better regulate the platform, ensuring its reliability and effectiveness. Furthermore, incorporating fiscal measures such as tax incentives for OCRP platforms can promote their development and integration, thereby offering a convenient and reliable channel for clothing disposal.

Overall, the findings related to the components of COM-B and domains of TDF in clothing disposal behavior underscore the necessity for targeted intervention and implementation options to address the identified issues. Applying the guidance provided by the BCW framework opens up avenues for creating effective interventions aimed at promoting sustainable clothing disposal behavior. This holistic strategy lays a thoughtful and strategic groundwork for advancing sustainable clothing disposal behaviors, considering both barriers and facilitators within the context of Chinese consumer culture.

6.2.2 Further implication for *Study 2*

Study 2 provides crucial insights into the barriers and facilitators of clothing disposal behavior among Chinese female Generation Y consumers. It also provides a comprehensive set of intervention and implementation options based on these identified barrier and facilitator factors. The study effectively applies the BCW-related frameworks to effectively address clothing disposal issues. The step-by-step method outlined in this case study serve as a noteworthy model for conducting research on behavior change interventions related to clothing consumption.

The findings and recommendations from this study hold immense relevance for public policymakers and stakeholders involved in the clothing disposal field. This includes disposal platform proprietors, recyclers, and community organizations, all of whom have a pivotal role in promoting sustainable disposal behavior on a broader scale.

The intervention and implementation options outlined in this study provide a valuable resource for policymakers and stakeholders seeking to promote sustainable disposal behavior. By putting these options into practice, they can actively contribute to a more environmentally conscious and responsible approach to clothing disposal.

Through the adoption the intervention and implementation options proposed in this study, stakeholders can proactively address the challenges associated with clothing disposal. These options provide practical guidance and serve as a blueprint for designing effective interventions that lead to clothing disposal behavior change. For instance, OCRP owners could tailor their operational approach based on user concerns and the recommended interventions highlighted in this study. This would help address platform-related challenges and encourage greater user engagement in sustainable disposal practices. Moreover, the study's insights provide valuable strategies for educating individuals, enhancing disposal infrastructure, and fostering

collaboration among various stakeholders.

6.3 Synthesis of discussion and conclusion (*MRO*)

To fulfill the ***MRO*** of proposing a procedural method that promote sustainable disposal behavior in China, this research first provides a comprehensive understanding of consumers' clothing consumption behavior across the purchase, use, and disposal phases. By identifying factors related to sustainable clothing consumption based on the categorization of Chinese consumers' behavior, the clothing consumption issues that need to be addressed are identified (***SRO1)***. Subsequently, a case study is conducted to develop a procedural method, including the identification of barriers and facilitators for disposal behavior issues, as well as intervention and implementation options, all aimed at promoting sustainable clothing disposal behavior among generation Y Chinese female consumers based on the identified behavior categorization issues (***SRO2)***. Thus, the ***MRO*** is achieved by implementing the full behavior change intervention design process throughout the stages of understanding the behavior, identifying intervention options, and identifying content and implementation options, as shown in Figure 6. As suggested by Michie et al. (2014), the intervention design process starts with a behavioral analysis of the issue, followed by a diagnosis to identify what needs to change, and then the diagnosis is linked to intervention and implementation options, creating a pathway for effecting the desired change. Therefore, the entire design process can be constituted the intervention proposal.

Based on the understanding of clothing consumption issues that need to be addressed for each category in ***Study 1*** and the development of a method for promoting sustainable clothing disposal behavior in ***Study 2***, this research successfully fulfills the ***MRO*** of proposing a procedural method that promote sustainable disposal behavior in China (See Figure 17). By combining a comprehensive analysis of consumer behavior categorization with evidence-based intervention strategies, this research bridges an existing literature gap and contributes significantly to the field of sustainable consumption behavior. The resulting intervention proposal serves as valuable insights and actionable recommendations for policymakers, stakeholders, and consumers, aiming to promote sustainable clothing disposal behavior and minimize environmental impact.

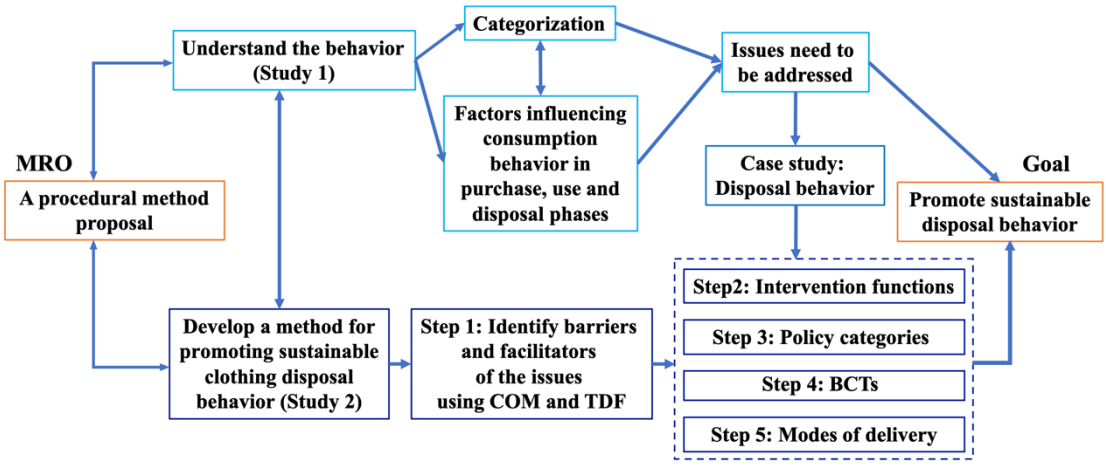

Figure 17. The relationship of the findings of *MRO, SRO1 and SRO2*.

Chapter 7. Limitation, future research and contribution

7.1 Limitations and future research

7.1.1 Limitations and future research for *Study 1*

Despite its contributions, ***Study 1*** has several limitations. Firstly, the data were collected in China's Liaoning province and may not be fully representative of all Chinese consumers due to the influence of local cultural values and norms. Because regional factors such as climate, lifestyle, and culture in different parts of China, such as the north and south, may contribute to variations in clothing consumption behaviors. Therefore, future studies will conduct cross-geographic investigations to explore a broader range of variation in clothing consumption behaviors.

Secondly, although the wardrobe study allowed us to investigate actual consumption behavior and understand variations in clothing consumption behavior, the small sample size may have limited the statistical power and generalizability of the findings. For instance, exclusion of the population aged over 70 years old in this study is one potential reason for missing content in the large-active category of the categorization matrix. Future studies will aim for larger sample sizes and include a wider range of age groups to accurately identify potential behavioral differences.

Thirdly, while the observational method helped us capture differences in clothing usage over a designated period, the 30-day observation period may not be sufficient to capture clothing use behavior for an entire season. It is possible that individuals in the small-active category may continue to wear certain items beyond the 30 days, while individuals in the large-passive category may exhibit more diverse clothing usage behaviors, leading to more pronounced differences between categories and even potential differentiation and segmentation within categories. Therefore, extending the observation period would be beneficial for future research.

Lastly, although this study examined various aspects of clothing use behavior and specific clothing attributes, such as the number of unused items, duration of use, price, brand level, and fiber content, certain aspects were excluded from the analysis. Factors such as the acquisition method (first-hand purchase, second-hand, or as a gift), origin of clothing, usage occasion, laundering practice, and and other clothing types such as bags and shoes (Klepp et al., 2020; Laitala & Klepp, 2020), which have potential to influent clothing use behavior, were not explored in this study. Additionally, accessories, particularly bags and shoes, were not included despite their widespread use, and they may exhibit potential differences across the identified categories. Therefore, future research will explore these additional practices and garment attributes to generate more detailed and accurate outcomes.

7.1.2 Limitations and future research for *Study 2*

Despite being an exploratory study with specific objectives, ***Study 2*** has some limitations. Firstly, the case study focused on a specific category, L-P, which consists mainly of Chinese female consumers from Generation Y. The study primarily addressed their clothing disposal issues with the aim of improving the disposal quantity of unused clothing items and promoting the usage of the OCRP. It is important to note that the findings of this study may not be universally applicable due to geographic and cultural limitations. China's unique cultural context may influence behaviors and conditions that are not applicable for most countries. Therefore, future research will conduct additional case studies that address the identified issues within each category to obtain a broader understanding.

Secondly, although the proposal of intervention and implementation options in this study is based on specific issues observed in particular populations, the study mainly focused on the intervention process related to disposal issues identified in ***study 1***. However, disposal behavior, as an outflow of clothing possession, is closely linked to clothing purchase and use behavior. Examining disposal behavior separately may overlook important information related to other phases of clothing consumption. Therefore, future studies will comprehensively consider the behaviors of purchase, use, and disposal for each category. A combination of multiple independent case studies could uncover potential connections between these behaviors and provide more comprehensive and in-depth recommendations in the intervention proposal.

Lastly, although TDF serves as an efficient theory-based behavioral science framework for identifying behavior issues within theoretical domain, there were instances of low reliabilities observed across several TDF domains. This could be attributed to the comprehensive scope of the framework and the potential overlap of constructs within it (Zhang & Hale, 2022). For instance, the situational factor related to event under Environment context and resources domain and social support through community activities under social influence domain appeared to overlap between different domains. In this study, the environmental context and resources domain within the TDF has been refined with sub-domains. However, the synthesis of domains is underdeveloped in this study, as potential interconnections may exist among barriers and facilitators within TDF domains. Further reconstruction among domains could be synthesized. To enhance reliability, future research could explore the possibility of synthesizing these TDF domains into more well-defined and distinct constructs in the context of sustainable clothing disposal behavior.

7.2 Contributions

This doctoral research focuses on proposing a procedural method for sustainable clothing disposal behavior through identifying factors for sustainable clothing consumption in China. It aims to create new values by integrating knowledge from

these diverse fields, including sustainability, clothing consumption, and behavior change, thereby facilitating problem-solving and informed decision-making within society. The outcome of this research provides academic implications for the clothing industry, innovation, and sustainable design research. Additionally, it offers practical implications for policymakers, educators, stakeholders involved in the clothing industry and sustainable consumption, as well as consumers.

7.2.1 Academic contributions

This research makes several significant academic contributions.

Comprehensive Clothing Consumption Perspective

Firstly, it categorizes consumers' behavior to identify factors related to sustainable clothing consumption throughout the entire consumption phases, including purchase, use, and disposal. Previous studies have mainly focused on the purchase phase, neglecting the complexities of the use phase. Existing studies that focus on the use and maintenance phases tend to investigate maintenance practices, such as washing and drying (Ackermann, 2018; Gray, 2017; Gwozdz et al., 2013; Laitala et al., 2018). Moreover, aside from Gwozdz et al. (2017), there is limited research categorizing consumers based on clothing consumption and proposing intervention strategies specific to each category. Therefore, this research expands upon the existing literature by introducing categorization and investigating the factors that influence sustainable consumption behavior across the purchase, use, and disposal phases. By doing so, it effectively addresses a significant gap in the current body of research on sustainable clothing consumption and provides a foundational understanding for formulating effective behavior change interventions, particularly in addressing environmental challenges within society.

Expansion in Theoretical Frames and Methods

In the realm of behavior change, this research goes beyond applying existing theoretical frameworks and methods. It makes a significant contribution to the fields of the sustainable clothing industry and sustainable consumption behavior research by filling an existing gap in the literature. This research demonstrates the application of theoretical frameworks to the study of clothing disposal behavior, an area that has not been extensively explored before. It extends these frameworks by integrating approaches within the context of sustainable clothing consumption. Several key expansions include:

Mixed Inductive-Deductive Approach: Most thematic analysis employing the frameworks related to BCW approach have been conducted deductively, which may overlook important factors that do not fit within established domains (McGowan et al., 2020). In contrast, this research employs a mixed inductive-deductive approach to identify factors related to behavior issues, allowing for the categorization of inductive themes into the TDF domains and COM components. This approach enhances the understanding of the various factors influencing sustainable clothing disposal

behaviors and adds depth to the analysis.

Statistical Analysis for Main Factors Extraction: By utilizing a statistical approach, the research extracts the main barrier and facilitator factors within the Capability, Opportunity, and Motivation components. This sheds light on the most influential components for effecting behavior change.

Refinement of TDF Domains: The study refines the broad domain of "Environment Context and Resources" within the Theoretical Domains Framework (TDF). This refinement involves categorizing it into specific sub-domains, including attributes of clothing items, situational factors related to events and time constraints, availability of wardrobe, and situational factors tied to disposal channels. This refined categorization provides a more nuanced understanding of the contextual forces shaping clothing disposal behavior.

Simplifying Option Identification through Pre-Evaluation: The research incorporates pre-evaluation through APEASE criteria, streamlining the process of option identification by significantly reducing the number of possible combinations between options. This innovative approach simplifies and enhances the identification of effective behavior change strategies.

7.2.2 Practical contributions

This research holds significant practical implications for policymakers, educators, consumers, and stakeholders involved in the clothing industry and sustainable consumption.

In ***Study 1***, it provides valuable insights for policymakers in understanding the variations in clothing consumption, enabling them to develop effective strategies for promoting sustainable clothing consumption practices tailored to each category. Furthermore, it provides guidance for educators to incorporate these findings into their curriculum, raising awareness among students about sustainable clothing consumption. Additionally, it offers recommendations for stakeholders in the clothing industry, including manufacturers, sustainable fashion brand owners, retailers, and recyclers as mentioned in subsection 6.1.6. Lastly, it provides consumers with a comprehensive understanding of clothing consumption behavior and its environmental impact.

In ***Study 2***, this research presents a method that specifically identify barriers and facilitators related to the issues, as well as intervention and implementation options, to promote sustainable disposal behavior among Chinese female consumers from Generation Y. The identification of influential factors, guided by the BCW-related frameworks, serves as valuable targets for evidence-based interventions aimed at facilitating behavioral change (Zhang & Hale, 2022). These intervention and implementation options have the potential to play a critical role in implementing effective strategies for policy makers. Furthermore, this study provides valuable insights by outlining specific intervention functions, policy categories, BCTs, and

modes of delivery for stakeholders in the field of clothing disposal. This information empowers stakeholders such as disposal platform owners, recyclers, and community organizations, to promote sustainable disposal behavior on a large scale.

7.2.3 Originality of this research

Investigation of consumers' actual clothing consumption behavior

In ***Study 1***, a wardrobe study is employed to understand consumers' current clothing consumption behavior. This methodological approach examines the relationship between clothing items within an individual's wardrobe by registering and analyzing the garments owned by individuals (Klepp & Bjerck, 2014; Klepp et al., 2020; Laitala & Klepp, 2011), which necessitates actual behavior observation and data gathering. To achieve this, a two-phase wardrobe study is conducted, including an observation phase and a wardrobe survey. The observation phase records participants' 30-day clothing use behavior through daily photograph logs, while the wardrobe survey phase focuses on designated clothing items with the highest frequency identified in the observation phase, as well as other relevant date throughout the entire consumption phases. The utilization of the wardrobe study addresses the gap in the investigation into clothing use behavior based on actual observation. To investigate the target population and address specific clothing consumption issues, we categorized the clothing consumption behavior of Chinese consumers using a matrix based on the total number of clothing items and frequency of clothing usage. Three categories representing clothing consumption issues in the purchase, use, and disposal phases were identified. This categorization extends the existing literature and provides a research foundation for the subsequent intervention proposal tailored to the designated category in the case study. Subsequently, a statistical method is conducted for comparison among consumer categories, which provides a solid foundation for further intervention research.

Exploration of consumers' unused clothing items

This research extends beyond focusing solely on in-use clothing items and delves into clothing items that are owned but unused. In ***Study 1***, the quantity of unused clothing items is investigated by observing the number of clothing items actually used during a designated period. The findings regarding the presence of unused clothing shed light on various issues, including consumers' overall clothing ownership, challenges related to clothing utilization, and potential barriers to disposal. In ***Study 2***, the focus shift to unused clothing items as a basis for studying the factors that hinder clothing disposal behavior. By exploring the reasons why consumers choose not to dispose of specific types of clothing they do not wear, opportunities for clothing disposal interventions are identified. It is worth noting that most existing research on clothing disposal primarily concentrates on clothing items that consumers have already designated for disposal, overlooking the aspect of unused clothing. Therefore, the findings of this study contribute to expanding the existing literature on behavior change interventions

for current clothing consumption behavior and provide valuable insights into underlying factors affecting sustainable clothing practices.

Expansion in Theoretical Frames and Methods

In ***Study 2***, by adopting the theory-based frameworks, the frameworks related to BCW, such as COM-B, TDF, and intervention function which have been widely applied in implementation science and health (Michie et al., 2014), this research develops a framework with the proposal of intervention functions, policy categories, BCTs, and modes of delivery for clothing disposal behavior among Chinese female consumers of Generation Y. This extends the existing literature and provides interventions for promoting sustainable clothing disposal behavior, contributing to the research development in the field of sustainable consumption behavior.

This research takes a step further by extending the application of the BCW frameworks. In particular, it introduces a distinctive method by integrating statistical analysis into the BCW framework, refines the broad domain of Environment Context and Resources within the TDF into sub-domains in the context of clothing disposal behavior, and simplifies the process of option identification.

The BCW frameworks renowned for its systematic approach to behavior change interventions, is employed to address the issues of sustainable clothing disposal behavior in this study. Using statistical approach, the study extracts main barrier and facilitator factors within the COM components, shedding light on the most influential components of behavior change. This statistical extraction provides a quantitative basis for understanding the nuanced interplay between various factors within the BCW framework.

Moreover, a significant innovation in the application of the BCW lies in the refinement of the broad domain of "Environment Context and Resources" within the TDF, coupled with the utilization of pre-evaluation through APEASE criteria. The refinement process involves a specific categorization of sub-domains, including attributes of the clothing item, situational factors related to events and time constraints, availability of wardrobe, and situational factors related to disposal channels. By delving deeper into these sub-domains, the research provides a more granular perspective on the contextual influences that shape clothing disposal behavior. The pre-evaluation through APEASE criteria simplifies the process of option identification by significantly reducing the number of possible combinations between options.

The approaches of statistical extraction and domain refinement enhance the precision and applicability of the BCW frameworks. It allows for a more targeted and tailored design of behavior change interventions, addressing specific barriers and facilitators identified in the study. This methodological expansion contributes to the advancement of behavior change research by offering a systematic approach to intervention design, particularly within the context of sustainable clothing disposal behavior among Chinese Generation Y consumers.

Publication

Journal Paper

[1] Guo Wenjun, Kim Eunyoung, “Categorizing Chinese Consumers’ Behavior to Identify Factors Related to Sustainable Clothing Consumption”. *Sustainability*, 2023; 15(7):6126. DOI: 10.3390/su15076126

[2] Guo Wenjun, Kim Eunyoung, “Identifying Factors Influencing Consumers’ Choice of Disposal Channels Regarding Children’s Clothing in China”. *Sustainability*, 2023; 15(16): 12628. DOI: 10.3390/su151612628

Conference Proceedings and Presentations

[1] Guo Wenjun, Kim Eunyoung, “A Study of Sustainable Design Methods for Clothing Recycling from the Perspective of Reverse Thinking”, The 14th European Academy of Design Conference, Lancaster, UK, 11-16 Oct. 2021, 12 pages.

[2] Guo Wenjun, Kim Eunyoung, & Yuizono Takaya, “A Study on Chinese Fashion Design Students’ Perceptions on Sustainable Practices throughout the Lifecycle of Clothing Products” The 8th IAFOR International Conference on Education, Hawaii, USA, 05-08 Jan. 2023,13 pages.

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Appendices

Appendix A: Links between COM-B, TDF and intervention functions within BCW

COM-B	TDF	Intervention functions
Physical capability	Physical skills	Training
Psychological capability	Knowledge	Education
	Cognitive and interpersonal skills	Training
	Memory, attention and decision process	Training
		Environmental restructuring
		Enablement
	Behavioral regulation	Education
		Training
		Modelling
		Enablement
Reflective motivation	Professional/social role and identity	Education
		Persuasion
		Modelling
	Beliefs about capabilities	Education
		Persuasion
		Modelling
		Enablement
	Optimism	Education
		Persuasion
		Modelling
		Enablement
	Beliefs about consequences	Education
		Persuasion
		Modelling
	Intentions	Education
		Persuasion
		Incentivization
		Coercion
		Modelling
	Goals	Education
		Persuasion
		Incentivization
		Coercion
		Modelling
		Enablement

Automatic motivation	Reinforcement	Training
		Incentivization
		Coercion
		Environmental restructuring
	Emotion	Persuasion
		Incentivization
		Coercion
		Modelling
		Enablement
Physical opportunity	Environmental context and resources	Training
		Restriction
		Environmental restructuring
		Enablement
Social opportunity	Social influences	Restriction
		Environmental restructuring
		Modelling
		Enablement

Appendix B: Behaviour Change Technique Taxonomy (v1)

No.	Label	Definition	Examples
1.Goals and planning			
1.1	**Goal setting (behaviour)**	Set or agree a goal defined in terms of the behaviour to be achieved Note: only code goal-setting if there is sufficient evidence that goal set as part of intervention; if goal unspecified or a behavioural outcome, code 1.3, Goal setting (outcome); If the goal defines a specific context, frequency, duration or intensity for the behaviour, also code 1.4, Action planning	Agree a daily walking goal (e.g. 3 miles) with the person and reach agreement about the goal Set the goal of eating 5 pieces of fruit per day as specified in public health guidelines
1.2	**Problem solving**	Analyse, or prompt the person to analyse, factors influencing the behaviour and generate or select strategies that include overcoming barriers and/or increasing facilitators (includes 'Relapse Prevention' and 'Coping Planning) Note: barrier identification without solutions is not sufficient. If the BCT does not include analysing the behavioural problem, consider 12.3, Avoidance/changing exposure to cues for the behaviour, 12.1, Restructuring the physical environment,12.2, Restructuring the social environment, or 11.2, Reduce negative emotions	Identify specific triggers (e.g. being in a pub, feeling anxious) that generate the urge/want/ need to drink and develop strategies for avoiding environmental triggers or for managing negative emotions, such as anxiety, that motivate drinking Prompt the patent to identify barriers preventing them from starting a new exercise regime e.g., lack of motivation, and discuss ways in which they could help overcome them e.g., going to the gym with a buddy
1.3	**Goal setting (outcome)**	Set or agree a goal defined in terms of a positive outcome of wanted behaviour Note:only code guidelines if set as a goal in an intervention context; if goal is a behaviour, code 1.1, Goal setting (behaviour); if goal unspecified code 1.3, Goal setting (outcome)	Set a weight loss goal (e.g., 0.5 kilogram over one week) as an outcome of changed eating patterns

1.4	**Action planning**	Prompt detailed planning of performance of the behaviour (must include at least one of context, frequency, duration and intensity). Context may be environmental (physical or social) or internal (physical, emotional or cognitive) (includes 'Implementation Intentions') Note: evidence of action planning does not necessarily imply goal setting, only code latter if sufficient evidence	Encourage a plan to carry condoms when going out socially at weekends Prompt planning the performance of a particular physical activity (e.g., running) at a particular time (e.g., before work) on certain days of the week
1.5	**Review behaviour goal(s)**	Review behaviour goal(s) jointly with the person and consider modifying goal(s) or behaviour change strategy in light of achievement. This may lead to re-setting the same goal, a small change in that goal or setting a new goal instead of (or in addition to) the first, or no change Note: if goal specified in terms of behaviour, code 1.5, Review behaviour goal(s), if goal unspecified, code 1.7, Review outcome goal(s);if discrepancy created consider also 1.6, Discrepancy between current behaviour and goal	Examine how well a person's performance corresponds to agreed goals e.g., whether they consumed less than one unit of alcohol per day, and consider modifying future behavioural goals accordingly e.g.by increasing or decreasing alcohol target or changing type of alcohol consumed
1.6	**Discrepancy between current behaviour and goal**	Draw attention to discrepancies between a person's current behaviour (in terms of the form, frequency, duration,or intensity of that behaviour) and the person's previously set outcome goals, behavioural goals or action plans (goes beyond self-monitoring of behaviour) Note: if discomfort is created only code 13.3, Incompatible beliefs and not 1.6, Discrepancy between current behaviour and goal; if goals are modified, also code 1.5, Review behaviour goal(s) and/or 1.7, Review outcome goal(s); if feedback is provided, also code 2.2, Feedback on behaviour	Point out that the recorded exercise fell short of the goal set

1.7	Review out-come goal(s)	Review outcome goal(s) jointly with the person and consider modifying goal(s) in light of achievement. This may lead to re-setting the same goal, a small change in that goal or setting a new goal instead of, or in addition to the first Note: if goal specified in terms of behaviour, code 1.5, Review behaviour goal(s), if goal unspecified, code 1.7, Review outcome goal(s); if discrepancy created consider also 1.6, Discrepancy between current behaviour and goal	Examine how much weight has been lost and consider modifying outcome goal(s) accordingly e.g.by increasing or decreasing subsequent weight loss targets
1.8	Behavioural contract	Create a written specification of the behaviour to be performed, agreed by the person, and witnessed by another Note: also code 1.1, Goal setting (behaviour)	Sign a contract with the person e.g., specifying that they will not drink alcohol for one week
1.9	Commitment	Ask the person to affirm or reaffirm statements indicating commitment to change the behaviour Note: if defined in terms of the behaviour to be achieved also code 1.1, Goal setting (behaviour)	Ask the person to use an 'I will' statement to affirm or reaffirm a strong commitment (i.e. using the words 'strongly', 'committed" or 'high priority') to start, continue or restart the attempt to take medication as prescribed
2. Feedback and monitoring			

2.1	**Monitoring of behaviour by others without feedback**	Observe or record behaviour with the person's knowledge as part of a behaviour change strategy Note: if monitoring is part of a data collection procedure rather than a strategy aimed at changing behaviour, do not code; if feedback given, code only 2.2, Feedback on behaviour, and not 2.1, Monitoring of behaviour by others without feedback; if monitoring outcome(s) code 2.5, Monitoring outcome(s) of behaviour by others without feedback; if self-monitoring behaviour, code 2.3, Self-monitoring of behaviour	Watch hand washing behaviours among health care staff and make notes on context, frequency and technique used
2.2	**Feedback on behaviour**	Monitor and provide informative or evaluative feedback on performance of the behaviour (e.g., form, frequency, duration, intensity) Note: if Biofeedback, code only 2.6, Biofeedback and not 2.2, Feedback on behaviour; if feedback is on outcome(s) of behaviour, code 2.7, Feedback on outcome(s) of behaviour; if there is no clear evidence that feedback was given, code 2.1, Monitoring of behaviour by others without feedback; if feedback on behaviour is evaluative e.g. praise, also code 10.4, Social reward	Inform the person of how many steps they walked each day (as recorded on a pedometer) or how many calories they ate each day (based on a food consumption questionnaire).
2.3	**Self-monitoring of behaviour**	Establish a method for the person to monitor and record their behaviour(s) as part of a behaviour change strategy Note: if monitoring is part of a data collection procedure rather than a strategy aimed at changing behaviour, do not code; if monitoring of outcome of behaviour, code 2.4, Self-monitoring of outcome(s) of behaviour; if monitoring is by someone else (without feedback), code 2.1, Monitoring of behaviour by others without feedback	Ask the person to record daily, in a diary, whether they have brushed their teeth for at least two minutes before going to bed Give patient a pedometer and a form for recording daily total number of steps

2.4	**Self-monitoring of outcome(s)of behaviour**	Establish a method for the person to monitor and record the outcome(s) of their behaviour as part of a behaviour change strategy Note: if monitoring is part of a data collection procedure rather than a strategy aimed at changing behaviour, do not code; if monitoring behaviour, code 2.3, Self-monitoring of behaviour; if monitoring is by someone else (without feedback), code 2.5, Monitoring outcome(s) of behaviour by others without feedback	Ask the person to weigh themselves at the end of each day, over a two-week period, and record their daily weight on a graph to increase exercise behaviours
2.5	**Monitoring outcome(s) of behaviour by others without feedback**	Observe or record outcomes of behaviour with the person's knowledge as part of a behaviour change strategy Note: if monitoring is part of a data collection procedure rather than a strategy aimed at changing behaviour, do not code; if feedback given,code only 2.7, Feedback on outcome(s) of behaviour; if monitoring behaviour code 2.1, Monitoring of behaviour by others without feedback; if self-monitoring outcome(s), code 2.4, Self-monitoring of outcome(s) of behaviour	Record blood pressure, blood glucose, weight loss, or physical fitness
2.6	**Biofeedback**	Provide feedback about the Body (e.g., physiological or biochemical state) using an external monitoring device as part of a behaviour change strategy Note: if Biofeedback, cod only 2.6, Biofeedback and not 2.2, Feedback on behaviour or 2.7, Feedback on outcome(s) of behaviour	Inform the person of their blood pressure reading to improve adoption of health behaviours

2.7	Feedback on outcome(s) of behaviour	Monitor and provide feedback on the outcome of performance of the behaviour Note: if Biofeedback, code only 2.6, Biofeedback and not 2.7, Feedback on outcome(s) of behaviour; if feedback is on behaviour code 2.2, Feedback on behaviour;if there is no clear evidence that feedback was given code 2.5, Monitoring outcome(s) of behaviour by others without feedback; if feedback on behaviour is evaluative e.g., praise, also code 10.4, Social reward	Inform the person of how much weight they have lost following the implementation of a new exercise regime
3. Social support			
3.1	Social support (unspecified)	Advise on, arrange or provide social support (e.g., from friends, relatives, colleagues,' buddies' or staff) or non-contingent praise or reward for performance of the behaviour. It includes encouragement and counselling, but only when it is directed at the behaviour Note: attending a group class and/ or mention of 'follow-up' does not necessarily apply this BCT, support must be explicitly mentioned; if practical, code 3.2, Social support (practical); if emotional, code 3.3, Social support (emotional) (includes 'Motivational interviewing' and 'Cognitive Behavioural Therapy')	Advise the person to call a 'buddy' when they experience an urge to smoke Arrange for a housemate to encourage continuation with the behaviour change programme Give information about a self-help group that offers support for the behaviour

3.2	**Social support (practical)**	Advise on, arrange, or provide practical help (e.g., from friends, relatives, colleagues, 'buddies' or staff) for performance of the behaviour Note: if emotional, code 3.3, Social support (emotional); if general or unspecified, code 3.1, Social support (unspecified)If only restructuring the physical environment or adding objects to the environment, code 12.1, Re-structuring the physical environment or 12.5, Adding objects to the environment; attending a group or class and/or mention of 'follow-up' does not necessarily apply this BCT, support must be explicitly mentioned.	Ask the partner of the patient to put their tablet on the breakfast tray so that the patient remembers to take it
3.3	**Social support (emotional)**	Advise on, arrange, or provide emotional social support (e.g. from friends, relatives, colleagues, 'buddies' or staff) for performance of the behaviour Note: if practical, code 3.2, Social support (practical); if unspecified, code 3.1, Social support (unspecified)	Ask the patient to take a partner or friend with them to their colonoscopy appointment
4. Shaping knowledge			
4.1	**Instruction on how to perform a behaviour**	Advise or agree on how to per-form the behaviour (includes 'Skills training') Note: when the person attends classes such as exercise or cookery, code 4.1, Instruction on how to perform the behaviour, 8.1, Behavioural practice/rehearsal and 6.1, Demonstration of the behaviour	Advise the person how to put a condom on a model of a penis correctly
4.2	**Information about ante-cedents**	Provide information about antecedents (e.g., social and environmental situations and events, emotions, cognitions) that reliably predict performance of the behaviour	Advise to keep a record of snacking and of situations or events occurring prior to snacking

4.4	**Behavioural experiments**	Advise on how to identify and test hypotheses about the behaviour, its causes and consequences, by collecting and interpreting data	Ask a family physician to give evidence-based advice rather than prescribe antibiotics and to note whether the patients are grateful or annoyed
5. Natural consequences			
5.1	**Information about health consequences**	Provide information (e.g., written, verbal, visual) about health consequences of performing the behaviour Note: consequences can be for any target, not just the recipient(s) of the intervention; emphasising importance of consequences is not sufficient; if information about emotional consequences, code 5.6, Information about emotional consequences; if about social, environmental or unspecified consequences code 5.3, Information about social and environmental consequences	Explain that not finishing a course of antibiotics can increase susceptibility to future infection Present the likelihood of contracting a sexually transmitted infection following unprotected sexual behaviour
5.2	**Salience of consequences**	Use methods specifically designed to emphasise the consequences of performing the behaviour with the aim of making them more memorable (goes beyond informing about consequences) Note: if information about consequences, also code 5.1, Information about health consequences, 5.6, Information about emotional consequences or 5.3, Information about social and environmental consequences	Produce cigarette packets showing pictures of health consequences e.g., diseased lungs, to highlight the dangers of continuing to smoke

5.3	Information about social and environmental consequences	Provide information (e.g., written, verbal, visual) about social and environmental consequences of performing the behaviour Note: consequences can be for any target, not just the recipient(s) of the intervention; if information about health or consequences, code 5.1, Information about health consequences; if about emotional consequences, code 5.6, Information about emotional consequences; if unspecified, code 5.3, Information about social and environmental consequences	Tell family physician about financial remuneration for conducting health screening Inform a smoker that the majority of people disapprove of smoking in public places
5.4	Monitoring of emotional consequences	Prompt assessment of feelings after attempts at performing the behaviour	Agree that the person will record how they feel after taking their daily walk
5.5	Anticipated regret	Induce or raise awareness of expectations of future regret about performance of the unwanted behaviour Note: not including 5.6, Information about emotional consequences; if suggests adoption of a perspective or new perspective in order to change cognitions also code 13.2, Framing/reframing	Ask the person to assess the degree of regret they will feel if they do not quit smoking
5.6	Information about emotional consequences	Provide information (e.g. written, verbal, visual) about emotiona1 consequences of performing the behaviour Note: consequences can be related to emotional health disorders (e.g. depression, anxiety) and/or states of mind (e.g., low mood, stress); not including 5.5, Anticipated regret; consequences can be for any target, not just the recipient(s) of the intervention; if information about health consequences code 5.1, Information about health consequences; if about social, environmental or unspecified code 5.3, Information about social and environmental consequences	Explain that quitting smoking increases happiness and life satisfaction

6. Comparison of behaviour			
6.1	**Demonstration of the behaviour**	Provide an observable sample of the performance of the behaviour, directly in person or indirectly e.g., via film, pictures, for the person to aspire to or imitate (includes 'Modelling'). Note: if advised to practice, also code, 8.1, Behavioural practice and rehearsal; If provided with instructions on how to perform, also code 4.1, Instruction on how to perform the behaviour	Demonstrate to nurses how to raise the issue of excessive drinking with patients via a role-play exercise
6.2	**Social comparison**	Draw attention to others' performance to allow comparison with the person's own performance Note: being in a group setting does not necessarily mean that social comparison is actually taking place	Show the doctor the proportion of patients who were prescribed antibiotics for a common cold by other doctors and compare with their own data
6.3	**Information about others' approval**	Provide information about what other people think about the behaviour. The information clarifies whether others will like, approve or disapprove of what the person is doing or will do	Tell the staff at the hospital ward that staff at all other wards approve of washing their hands according to the guidelines
7.Associations			
7.1	**Prompts/ cues**	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour. The prompt or cue would normally occur at the time or place of performance Note: when a stimulus is linked to a specific action in an if-then plan including one or more of frequency, duration or intensity also code 1.4, Action planning.	Put a sticker on the bathroom mirror to remind people to brush their teeth

7.2	**Cue signal-ling reward**	Identify an environmental stimulus that reliably predicts that reward will follow the behaviour (includes 'Discriminative cue')	Advise that a fee will be paid to dentists for a particular dental treatment of 6-8 year old, but not older, children to encourage delivery of that treatment (the 6-8 year old children are the environmental stimulus)
7.3	**Reduce prompts/ cues**	Withdraw gradually prompts to perform the behaviour (includes 'Fading')	Reduce gradually the number of reminders used to take medication
7.4	**Remove access to the reward**	Advise or arrange for the person to be separated from situations in which unwanted behaviour can be rewarded in order to reduce the behaviour (includes 'Time out')	Arrange for cupboard containing high calorie snacks to be locked for a specified period to reduce the consumption of sugary foods in between meals
7.5	**Remove aversive stimulus**	Advise or arrange for the removal of an aversive stimulus to facilitate behaviour change (includes 'Escape learning')	Arrange for a gym-buddy to stop nagging the person to do more exercise in order to increase the desired exercise behaviour
7.6	**Satiation**	Advise or arrange repeated exposure to a stimulus that reduces or extinguishes a drive for the unwanted behaviour	Arrange for the person to eat large quantities of chocolate, in order to reduce the person's appetite for sweet foods
7.7	**Exposure**	Provide systematic confronta-tion with a feared stimulus to reduce the response to a later encounter	Agree a schedule by which the person who is frightened of surgery will visit the hospital where they are scheduled to have surgery

7.8	**Associative learning**	Present a neutral stimulus jointly with a stimulus that already elicits the behaviour repeatedly until the neutral stimulus elicits that behaviour (includes 'Classical/Pavlovian Conditioning') Note: when a BCT involves reward or punishment,code one or more of:10.2, Material reward (behaviour); 10.3, Non-specific reward;10.4, Social reward, 10.9, Self-reward;10.10, Reward (outcome)	Present repeatedly fatty foods with a disliked sauce to discourage the consumption of fatty foods
8. Repetition and substitution			
8.1	**Behavioural practice/ rehearsal**	Prompt practice or rehearsal of the performance of the behaviour one or more times in a context or at a time when the performance may not be necessary, in order to increase habit and skill Note: if aiming to associate performance with the context, also code 8.3, Habit formation	Prompt asthma patients to practice measuring their peak flow in the nurse's consulting room
8.2	**Behaviour substitution**	Prompt substitution of the unwanted behaviour with a wanted or neutral behaviour Note:if this occurs regularly, also code 8.4, Habit reversal	Suggest that the person goes for a walk rather than watches television
8.3	**Habit formation**	Prompt rehearsal and repetition of the behaviour in the same context repeatedly so that the context elicits the behaviour Note: also code 8.1, Behavioural practice/rehearsal	Prompt patients to take their statin tablet before brushing their teeth every evening
8.4	**Habit reversal**	Prompt rehearsal and repetition of an alternative behaviour to replace an unwanted habitual behaviour Note: also code 8.2, Behaviour substitution	Ask the person to walk up stairs at work where they previously always took the lift

8.5	**Overcorrec-tion**	Ask to repeat the wanted behaviour in an exaggerated way following an unwanted behaviour	Ask to eat only fruit and vegetables the day after a poor diet
8.6	**Generali-sation of a target behaviour**	Advise to perform the wanted behaviour, which is already performed in a particular situation, in another situation	Advise to repeat toning exercises learned in the gym when at home
8.7	**Graded tasks**	Set easy-to-perform tasks, making them increasingly difficult, but achievable, until behaviour is performed	Ask the person to walk for 100 yards a day for the first week, then half a mile a day after they have successfully achieved 100 yards, then two miles a day after they have successfully achieved one mile
9. Comparison of outcomes			
9.1	**Credible source**	Present verbal or visual communication from a credible source in favour of or against the behaviour Note:code this BCT if source generally agreed on as credible e.g. health professionals, celebrities or words used to indicate expertise or leader in field and if the communication has the aim of persuading; if information about health consequences, also code 5.1, Information about health consequences, if about emotional consequences, also code 5.6, Information about emotional consequences; if about social, environmental or unspecified consequences also code 5.3, Information about social and environmental consequences	Present a speech given by a high status professional to emphasise the importance of not exposing patients to unnecessary radiation by ordering x-rays for back pain

9.2	**Pros and cons**	Advise the person to identify and compare reasons for wanting (pros) and not wanting to (cons) change the behaviour (includes 'Decisional balance') Note: if providing information about health consequences, also code 5.1, Information about health consequences;if providing information about emotional consequences, also code 5.6, Information about emotional consequences; if providing information about social, environmental or unspecified consequences also code 5.3, Information about social and environmental consequences	Advise the person to list and compare the advantages and disadvantages of prescribing antibiotics for upper respiratory tract infections
9.3	**Comparative imagining of future outcomes**	Prompt or advise the imagining and comparing of future outcomes of changed versus unchanged behaviour	Prompt the person to imagine and compare likely or possible outcomes following attending versus not attending a screening appointment
10. Reward and threat			
10.1	**Material incentive (behaviour)**	Inform that money, vouchers or other valued objects will be delivered if and only if there has been effort and/or progress in performing the behaviour (includes' Positive reinforcement') Note: if incentive is social, code 10.5, Social incentive if unspecified code 10.6, Non-specific incentive, and not 10.1, Material incentive (behaviour); if incentive is for outcome, code 10.8, Incentive (outcome). If reward is delivered also code one of:10.2, Material reward (behaviour); 10.3, Non-specific reward;10.4, Social reward, 10.9, Self-reward;10.10, Reward (outcome)	Inform that a financial payment will be made each month in pregnancy that the woman has not smoked

10.2	**Material Reward (behaviour)**	Arrange for the delivery of money, vouchers or other valued objects if and only if there has been effort and/or progress in performing the behaviour (includes 'Positive reinforcement') Note: If reward is social, code 10.4, Social reward, if unspecified code 10.3, Non-specific reward, and not 10.1, Material reward (behaviour); if reward is for outcome, code 10.10, Reward (outcome). If informed of reward in advance of rewarded behaviour, also code one of: 10.1, Material incentive (behaviour); 10.5, Social incentive; 10.6, Non-specific incentive;10.7, Self-incentive; 10.8, Incentive (outcome)	Arrange for the person to receive money that would have been spent on cigarettes if and only if the smoker has not smoked for one month
10.3	**Non-specific reward**	Arrange delivery of a reward if and only if there has been effort and/or progress in performing the behaviour (includes 'Positive reinforcement') Note: if reward is material, code 10.2, Material reward (behaviour), if social, code 10.4, Social reward, and not 10.3, Non-specific reward; if reward is for outcome code 10.10, Reward (outcome). If informed of reward in advance of rewarded behaviour, also code one of: 10.1, Material incentive (behaviour);10.5, Social incentive;10.6, Non-specific incentive;10.7, Self-incentive; 10.8, Incentive (outcome)	Identify something (e.g.an activity such as a visit to the cinema) that the person values and arrange for this to be delivered if and only if they attend for health screening

10.4	**Social reward**	Arrange verbal or non-verbal reward if and only if there has been effort and/or progress in performing the behaviour (includes 'Positive reinforcement') Note:if reward is material, code 10.2, Material reward (behaviour), if unspecified code 10.3, Non-specific reward, and not 10.4, Social reward; if reward is for outcome code 10.10, Reward (outcome). If informed of reward in advance of rewarded behaviour, also code one of: 10.1, Material incentive (behaviour); 10.5, Social incentive; 10.6, Non-specific incentive; 10.7, Self-incentive; 10.8, Incentive (outcome)	Congratulate the person for each day they eat a reduced fat diet
10.5	**Social incentive**	Inform that a verbal or non-verbal reward will be delivered if and only if there has been effort and/or progress in performing the behaviour (includes 'Positive reinforcement') Note: if incentive is material, code 10.1, Material incentive (behaviour), if unspecified code 10.6, Non-specific incentive, and not 10.5, Social incentive; if incentive is for outcome code 10.8, Incentive (outcome). If reward is delivered also code one of: 10.2, Material reward (behaviour); 10.3, Non-specific reward;10.4, Social reward,10.9, Self-reward; 10.10,Reward (outcome)	Inform that they will be congratulated for each day they eat a reduced fat diet

10.6	**Non-specific incentive**	Inform that a reward will be delivered if and only if there has been effort and/or progress in performing the behaviour (includes 'Positive reinforcement') Note: if incentive is material, code 10.1, Material incentive (behaviour), if social, code 10.5, Social incentive and not 10.6, Non-specific incentive; if incentive is for outcome code 10.8, Incentive (outcome). If reward is delivered also code one of: 10.2, Material reward (behaviour); 10.3, Non-specific reward;10.4, Social reward,10.9, Self-reward; 10.10, Reward (outcome)	Identify an activity that the person values and inform them that this will happen if and only if they attend for health screening
10.7	**Self-incentive**	Plan to reward self in future if and only if there has been effort and/or progress in performing the behaviour Note: if self-reward is material, also code 10.1, Material incentive (behaviour), if social, also code 10.5, Social incentive, if unspecified, also code 10.6, Non-specific incentive; if incentive is for outcome code 10.8, Incentive (outcome). If reward is delivered also code one of: 10.2, Material reward (behaviour); 10.3, Non-specific reward;10.4, Social reward,10.9, Self-reward;10.10, Reward (outcome)	Encourage to provide self with material (e.g., new clothes) or other valued objects if and only if they have adhered to a healthy diet

10.8	**Incentive (outcome)**	Inform that a reward will be delivered if and only if there has been effort and/or progress in achieving the behavioural outcome (includes 'Positive reinforcement') Note: this includes social, material, self-and non-specific incentives for outcome; if incentive is for the behaviour code 10.5, Social incentive,10.1, Material incentive (behaviour),10.6, Non-specific incentive or 10.7, Self-incentive and not 10.8, Incentive (outcome). If reward is delivered also code one of: 10.2, Material reward (behaviour);10.3, Non-specific reward;10.4, Social reward,10.9, Self-reward; 10.10, Reward (outcome)	Inform the person that they will receive money if and only if a certain amount of weight is lost
10.9	**Self-reward**	Prompt self-praise or self-reward if and only if there has been effort and/or progress in performing the behaviour Note: if self-reward is material, also code 10.2, Material reward (behaviour), if social, also code 10.4, Social reward, if unspecified, also code 10.3, Non-specific reward; if reward is for outcome code 10.10, Reward (outcome). If informed of reward in advance of rewarded behaviour, also code one of:10.1, Material incentive (behaviour);10.5, Social incentive;10.6, Non-specific incentive;10.7, Self-incentive; 10.8, Incentive (outcome)	Encourage to reward self with Material (e.g., new clothes) or other valued objects if and only if they have adhered to a healthy diet

10.10	**Reward (outcome)**	Arrange for the delivery of a reward if and only if there has been effort and/or progress in achieving the behavioural outcome (includes 'Positive reinforcement') Note: this includes social, material, self-and non-specific rewards for outcome; if reward is for the behaviour code 10.4, Social reward,10.2, Material reward (behaviour),10.3, Non-specific reward or 10.9, Self-reward and not 10.10, Reward (outcome). If informed of reward in advance of rewarded behaviour, also code one of: 10.1, Material incentive (behaviour);10.5,Social incentive;10.6, Non-specific incentive; 10.7, Self-incentive; 10.8, Incentive (outcome)	Arrange for the person to receive money if and only if a certain amount of weight is lost
10.11	**Future punishment**	Inform that future punishment or removal of reward will be a consequence of performance of an unwanted behaviour (may include fear arousal)(includes 'Threat')	Inform that continuing to consume 30 units of alcohol per day is likely to result in loss of employment if the person continues
11.Regulation			
11.1	**Pharma-cological support**	Provide, or encourage the use of or adherence to, drugs to facilitate behaviour change Note: if pharmacological support to reduce negative emotions (i.e. anxiety) then also code 11.2, Reduce negative emotions	Suggest the patient asks the family physician for nicotine replacement therapy to facilitate smoking cessation
11.2	**Reduce negative emotions**	Advise on ways of reducing negative emotions to facilitate performance of the behaviour (includes 'Stress Management') Note: if includes analysing the behavioural problem, also code 1.2, Problem solving	Advise on the use of stress management skills, e.g., to reduce anxiety about joining Alcoholics Anonymous
11.3	**Conserving mental resources**	Advise on ways of minimising demands on mental resources to facilitate behaviour change	Advise to carry food calorie con-tent information to reduce the burden on memory in making food choices

11.4	**Paradoxical instructions**	Advise to engage in some form of the unwanted behaviour with the aim of reducing motivation to engage in that behaviour	Advise a smoker to smoke twice as many cigarettes a day as they usually do Tel the person to stay awake as long as possible in order to reduce insomnia
12.Antecedents			
12.1	**Restruc-turing the physical environment**	Change, or advise to change the physical environment in order to facilitate performance of the wanted behaviour or create barriers to the unwanted behaviour (other than prompts/cues, rewards and punishments) Note: this may also involve 12.3, Avoidance/reducing exposure to cues for the behaviour; if restructuring of the social environment code 12.2, Restructuring the social environment; if only adding objects to the environment, code 12.5, Adding objects to the environment	Advise to keep biscuits and snacks in a cupboard that is inconvenient to get to Arrange to move vending machine out of the school
12.2	**Restructur-ing the social environment**	Change, or advise to change the social environment in order to facilitate performance of the wanted behaviour or create barriers to the unwanted behaviour (other than prompts/cues, rewards and punishments) Note: this may also involve 12.3, Avoidance/reducing exposure to cues for the behaviour; if also restructuring of the physical environment also code 12.1, Restructuring the physical environment	Advise to minimise time spent with friends who drink heavily to reduce alcohol consumption
12.3	**Avoidance/ reducing exposure to cues for the behaviour**	Advise on how to avoid exposure to specific social and contextual/physical cues for the behaviour, including changing daily or weekly routines Note: this may also involve 12.1, Restructuring the physical environment and/or 12.2, Restructuring the social environment;I f the BCT includes analysing the behavioural problem, only code 1.2,Problem solving	Suggest to a person who wants to quit smoking that their social life focus on activities other than pubs and bars which have been associated with smoking

12.4	**Distraction**	Advise or arrange to use an alternative focus for attention to avoid triggers for unwanted behaviour	Suggest to a person who is trying to avoid between-meal snacking to focus on a topic they enjoy (e.g., holiday plans) instead of focusing on food
12.5	**Adding objects to the environment**	Add objects to the environment in order to facilitate performance of the behaviour Note: Provision of information (e.g. written, verbal, visual) in a booklet or leaflet is insufficient. If this is accompanied by social support, also code 3.2, Social support (practical); if the environment is changed beyond the addition of objects, also code 12.1, Restructuring the physical environment	Provide free condoms to facilitate safe sex Provide attractive toothbrush to improve tooth brushing technique
12.6	**Body changes**	Alter body structure, functioning or support directly to facilitate behaviour change	Prompt strength training, relaxation training or provide assistive aids (e.g., a hearing aid)
13. Identity			
13.1	**Identification of self as role model**	Inform that one's own behaviour may be an example to others	Inform the person that if they eat healthily, that may be a good example for their children

13.2	**Framing/ reframing**	Suggest the deliberate adoption of a perspective or new perspective on behaviour (e.g. its purpose) in order to change cognitions or emotions about performing the behaviour (includes 'Cognitive structuring'); If information about consequences then code 5.1, Information about health consequences, 5.6, Information about emotional consequences or 5.3, Information about social and environmental consequences instead of 13.2, Framing/reframing	Suggest that the person might think of the tasks as reducing sedentary behaviour (rather than increasing activity)
13.3	**Incompatible beliefs**	Draw attention to discrepancies between current or past behaviour and self-image, in order to create discomfort (includes 'Cognitive dissonance')	Draw attention to a doctor's liberal use of blood transfusion and their self-identification as a proponent of evidence-based medical practice
13.4	**Valued self-identity**	Advise the person to write or complete rating scales about a cherished value or personal strength as a means of affirming the person's identity as part of a behaviour change strategy (includes 'Self-affirmation')	Advise the person to write about their personal strengths before they receive a message advocating the behaviour change
13.5	**Identity associated with changed behaviour**	Advise the person to construct a new self-identity as someone who 'used to engage with the unwanted behaviour'	Ask the person to articulate their new identity as an 'ex-smoker
14. Scheduled consequences			
14.1	**Behaviour cost**	Arrange for withdrawal of something valued if and only if an unwanted behaviour is performed (includes 'Response cost'). Note if withdrawal of contingent reward code, 14.3, Remove reward	Subtract money from a prepaid refundable deposit when a cigarette is smoked
14.2	**Punishment**	Arrange for aversive con-sequence contingent on the performance of the unwanted behaviour	Arrange for the person to wear unattractive clothes following consumption of fatty foods

14.3	**Remove reward**	Arrange for discontinuation of contingent reward following performance of the unwanted behaviour (includes 'Extinction')	Arrange for the other people in the household to ignore the person every time they eat chocolate (rather than attending to them by criticising or persuading)
14.4	**Reward approximation**	Arrange for reward following any approximation to the target behaviour, gradually rewarding only performance closer to the wanted behaviour (includes 'Shaping') Note: also code one of 10.2, Material reward (behaviour);10.3, Non-specific reward;10.4, Social reward;10.9, Self-reward; 10.10, Reward (outcome)	Arrange reward for any reduction in daily calories, gradually requiring the daily calorie count to become closer to the planned calorie intake
14.5	**Rewarding completion**	Build up behaviour by arranging reward following final component of the behaviour; gradually add the components of the behaviour that occur earlier in the behavioural sequence (includes 'Backward chaining') Note: also code one of 10.2, Material reward (behaviour); 10.3, Non-specific reward;10.4, Social reward, 10.9, Self-reward; 10.10, Reward (outcome)	Reward eating a supplied low calorie meal; then make reward contingent on cooking and eating the meal; then make reward contingent on purchasing, cooking and eating the meal
14.6	**Situation-specific reward**	Arrange for reward following the behaviour in one situation but not in another (includes 'Discrimination training') Note: also code one of 10.2, Material reward(behaviour); 10.3, Non-specific reward;10.4, Social reward,10.9, Self-reward; 10.10, Reward (outcome)	Arrange reward for eating at mealtimes but not between meals

14.7	**Reward incompatible behaviour**	Arrange reward for responding in a manner that is incompatible with a previous response to that situation (includes 'Counter-conditioning') Note: also code one of 10.2, Material reward (behaviour); 10.3, Non-specific reward;10.4, Social reward,10.9, Self-reward; 10.10, Reward (outcome)	Arrange reward for ordering a soft drink at the bar rather than an alcoholic beverage
14.8	**Reward alternative behaviour**	Arrange reward for performance of an alternative to the unwanted behaviour (includes 'Differential reinforcement') Note: also code one of 10.2, Material reward (behaviour); 10.3, Non-specific reward;10.4, Social reward,10.9, Self-reward; 10.10, Reward (outcome); consider also coding 1.2, Problem solving	Reward for consumption of low fat foods but not consumption of high fat foods
14.9	**Reduce reward frequency**	Arrange for rewards to be made contingent on increasing duration or frequency of the behaviour (includes 'Thinning') Note: also code one of 10.2, Material reward (behaviour); 10.3, Non-specific reward;10.4, Social reward, 10.9, Self-reward;10.10, Reward (outcome)	Arrange reward for each day without smoking, then each week, then each month,then every 2 months and so on
14.10	**Remove punishment**	Arrange for removal of an unpleasant consequence contingent on performance of the wanted behaviour (includes 'Negative reinforcement')	Arrange for someone else to do housecleaning only if the person has adhered to the medication regimen for a week
15. Self-belief			
15.1	**Verbal persuasion about capability**	Tell the person that they can successfully perform the wanted behaviour, arguing against self-doubts and asserting that they can and will succeed	Tell the person that they can successfully increase their physical activity, despite their recent heart attack.
15.2	**Mental rehearsal of successful performance**	Advise to practice imagining performing the behaviour successfully in relevant contexts	Advise to imagine eating and enjoying a salad in a work canteen
15.3	**Focus on past success**	Advise to think about or list previous successes in performing the behaviour (orparts of it)	Advise to describe or list the occasions on which the person had ordered a non-alcoholic drink in a bar

15.4	**Self-talk**	Prompt positive self-talk (aloud or silently) before and during the behaviour	Prompt the person to tell themselves that a walk will be energising
16. Covert learning			
16.1	**Imaginary punishment**	Advise to imagine performing the unwanted behaviour in a real-life situation followed by imagining an unpleasant consequence (includes 'Covert sensitisation')	Advise to imagine overeating and then vomiting
16.2	**Imaginary reward**	Advise to imagine perform-ing the wanted behaviour in a real-life situation followed by imagining a pleasant consequence (includes 'Covert conditioning')	Advise the health professional to imagine giving dietary advice followed by the patient losing weight and no longer being diabetic
16.3	**Vicarious consequences**	Prompt observation of the Consequences (including rewards and punishments) for others when they perform the behaviour Note: if observation of health con-sequences, also code 5.1, Information about health consequences; if of emotional consequences, also code 5.6, Information about emotional consequences, if of social, environmental or unspecified consequences, also code 5.3, Information about social and environmental consequences	Draw attention to the positive comments other staff get when they disinfect their hands regularly

Following dissemination of BCTTv1 through publication, seminars and workshops, the following change are anticipated for version 2: The addition of BVT ‘Increase positive emotions’. Revised definitions or examples for the following BCTs: ‘non-specific reward’; ‘information about health consequences’; ‘social support’; ‘social comparison’.

[8] References to coding relate to using the Taxonomy to describe the content of published interventions.

Appendix C: Linking Intervention Functions to BCTs

Intervention function	Individual BCTs
Education	**Most frequently used BCTs:** • **Information about social and environmental consequences** • **Information about health consequences** • **Feedback on behaviour** • **Feedback on outcome(s) of the behaviour** • **Prompts/cues** • **Self-monitoring of behaviour** Less frequently used BCTs: • Biofeedback • Self-monitoring of outcome(s) of behaviour • Cue signalling reward • Satiation • Information about antecedents • Re-attribution • Behavioural experiments • Information about emotional consequences • Information about others' approval
Persuasion	**Most frequently used BCTs:** • **Credible source** • **Information about social and environmental consequences** • **Information about health consequences** • **Feedback on behaviour** • **Feedback on outcome(s) of the behaviour** Less frequently used BCTs: • Biofeedback • Re-attribution • Focus on past success • Verbal persuasion about capability • Framing/reframing • Identity associated with changed behaviour • Identification of self as role model • Information about emotional consequences • Salience of consequences • Information about others' approval • Social comparison
Incentivisation	**Most frequently used BCTs:** • **Feedback on behaviour** • **Feedback on outcome(s) of behaviour** • **Monitoring of behaviour by others without evidence of feedback** • **Monitoring outcome of behaviour by others without evidence of feedback** • **Self-monitoring of behaviour**

	Less frequently used BCTs: • Paradoxical instructions • Biofeedback • Self-monitoring of outcome(s) of behaviour • Cue signalling reward • Remove aversive stimulus • Reward approximation • Rewarding completion • Situation-specify reward • Reward incompatible behaviour • Reduce reward frequency • Reward alternate behaviour • Remove punishment • Social reward • Material reward • Material reward (outcome) • Self-reward • Non-specific reward • Incentive • Behavioural contract • Commitment • Discrepancy between current behaviour and goal • Imaginary reward
Coercion	**Most frequently used BCTs:** • **Feedback on behaviour** • **Feedback on outcome(s) of behaviour** • **Monitoring of behaviour by others without evidence of feedback** • **Monitoring outcome of behaviour by others without evidence of feedback** • **Self-monitoring of behaviour** Less frequently used BCTs: • Biofeedback • Self-monitoring of outcome(s) of behaviour • Remove access to the reward • Punishment • Behaviour cost • Remove reward • Future punishment • Behavioural contract • Commitment • Discrepancy between current behaviour and goal • Incompatible beliefs • Anticipated regret • Imaginary punishment
Training	**Most frequently used BCTs:** • **Demonstration of the behaviour** • **Instruction on how to perform a behaviour** • **Feedback on the behaviour** • **Feedback on outcome(s) of behaviour** • **Self-monitoring of behaviour**

	• **Behavioural practice/rehearsal** Less frequently used BCTs: • Biofeedback • Self-monitoring of outcome(s) of behaviour • Habit formation • Habit reversal • Graded tasks • Behavioural experiments • Mental rehearsal of successful performance • Self-talk • Self-reward
Restriction	*No BCTs in BCTTv1 are linked to this intervention function because they are focused on changing the way that people think, feel and react rather than the way the external environment limits their behaviour.*
Environmental restructuring	**Most frequently used BCTs:** • **Adding objects to the environment** • **Prompts/cues** • **Restructuring the physical environment** Less frequently used BCTs: • Cue signalling reward • Remove access to the reward • Remove aversive stimulus • Satiation • Exposure • Associative learning • Reduce prompt/cue • Restructuring the social environment
Modelling	**Most frequently used BCTs:** • **Demonstration of the behaviour**
Enablement	**Most frequently used BCTs:** • **Social support (unspecified)** • **Social support (practical)** • **Goal setting (behaviour)** • **Goal setting (outcome)** • **Adding objects to the environment** • **Problem solving** • **Action planning** • **Self-monitoring of behaviour** • **Restructuring the physical environment** • **Review behaviour goal(s)** • **Review outcome goal(s)** Less frequently used BCTs: • Social support (emotional) • Reduce negative emotions • Conserve mental resources • Pharmacological support • Self-monitoring of outcome(s) of behaviour • Behaviour substitution • Overcorrection

	• Generalisation of a target behaviour • Graded tasks • Avoidance/reducing exposure to cues for the behaviour • Restructuring the social environment • Distraction • Body changes • Behavioural experiments • Mental rehearsal of successful performance • Focus on past success • Self-talk • Verbal persuasion about capability • Self-reward • Behavioural contract • Commitment • Discrepancy between current behaviour and goal • Pros and cons • Comparative imagining of future outcomes • Valued self-identity • Framing/reframing • Incompatible beliefs • Identity associated with changed behaviour • Identification of self as role model • Salience of consequences • Monitoring of emotional consequences • Anticipated regret • Imaginary punishment • Imaginary reward • Vicarious consequences

Appendix D: Sample Form - Record of Participants' Daily Three-Item Wear for *Study 1*

No.	Date	Top	Outwear	Bottom
1	2021/10/01	**T1** (White cotton t-shirt from Uniqlo)	**O1** (Black oversized synthetic suit from Mo& Co)	**B1** (Light blue straight jeans from Levi's)
2	2021/10/02	**T2** (Yellow cotton t-shirt from Zara)	**O2** (White jeans jacket from G-star)	**B1**
3	2021/10/03	**T3** (Black linen shirt from Less)	**O2**	**B2** (Black long cotton blend knitted skirt from Zara)
4	2021/10/04	**T3**	**O3** (Gray plaid wool blend suit from VOV)	**B2**
5	2021/10/05	**T4** (Dark blue silk shirt from Edition)	**O3**	**B1**
6	2021/10/06	**T5** (White cotton t-shirt from Guess)	**O3**	**B2**
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Appendix E: Survey (phase 2) - Questionnaire Form for *Study 1*

Thank you very much for participating in the 30-day clothing use behavior observation survey in Phase 1. Based on the data from your clothing use behavior, further research survey has been conducted. We kindly request you to take some time to complete this survey.

This study is being conducted by Guo Wenjun and Kim Eunyoung from the Japan Advanced Institute of Science and Technology. All the information you provide will be used solely for academic research purposes and will be kept strictly confidential in accordance with the law. The findings of the study will only be presented in summarized form, and your name will not be used in any reports.

Part 1: Personal Information

Participant Number 01

1. What is your gender?
   a. Male ☐
   b. Female ☐

2. How old are you?
   a. 18–27 years ☐
   b. 28–37 years ☐
   c. 38–47 years ☐
   d. 48–57 years ☐
   e. 58 years and over ☐

3. What is your educational background?
   a. College and below ☐
   b. Undergraduate ☐
   c. Master degree or above ☐

4. What is your annual income?
   a. Less than 80,000 RMB ☐
   b. 80,001–160,000 RMB ☐
   c. 160,001–320,000 RMB ☐
   d. More than 320,001 RMB ☐

Part 2: Clothing Consumption Habits

5. What is your brand preference category?
   a. Budget brands (e.g., H&M or Uniqlo) ☐
   b. Casual/middle brands (e.g., Levi's, MLB, or FILA) ☐
   c. Premium brands (e.g., Louis Vuitton, Prada, or Moschino) ☐

6. What is your annual clothing expenditure (RMB)?

a. 2000 and below ☐

b. 2001–5000 ☐

c. 5001–10,000 ☐

d. 10,001–20,000 ☐

e. 20,001 and above ☐

7. How many new clothing items (including tops, outwear and bottoms) you buy per year?

a. 5 items or fewer ☐

b. 6–20 items ☐

c. 21–40 items ☐

d. 41 items or more ☐

8. What are your purchase priorities? (You can choose more than one)

a. Fashionable/trendy ☐

b. Price ☐

c. Fabric quality ☐

d. Aesthetics (e.g., design or style) ☐

e. Sustainable/environmentally production and brand ☐

f. Others ☐

9. What are the reasons you dispose of clothing items? (You can choose more than one)

a. Wear and tear ☐

b. Fashion issues ☐

c. Poor fit ☐

d. Wardrobe space ☐

e. Others ☐

10. Which disposal channels do you use? (You can choose more than one)

a. Conventional reuse and recycle channels (e.g., giving away, donation, reselling, recycling bins). ☐

b. Online clothing recycling platforms ☐

c. Throw away ☐

11. How many clothing items have you disposed of in the last 12 months?

a. Fewer than 10 items ☐

b. 11–20 items ☐

c. 21–30 items ☐

d. 31 items or more ☐

12. Have you had repair/repurpose experience in the last 12 months?

a. No ☐

b. Yes ☐

13. Based on the Phase 1 survey, you have used 50 items during the 30 days. How many unused clothing items for this season have you not worn (including tops, outwear, and bottoms)? _____

Part 3: Attributes of the clothing items you worn most frequently during 30 days in Phase 1 survey

I. The attributes of the top you worn most frequently during 30 days: (description of the top with picture attached)

14. How long have you owned this top?

a. Less than 1 year ☐
b. 1–2 years ☐
c. 2–3 years ☐
d. more than 3 years ☐

15. How much did this top cost (RMB)?

a. 200 and below ☐
b. 201–500 ☐
c. 501–1000 ☐
d. 1001–2000 ☐
e. 2001 and above ☐

16. What is the brand of this top? _____

17. What is the type of this top?

a. T-shirts/polos/singlets ☐
b. Shirts/blouses ☐
c. Blazers/hoodies ☐
d. Others ☐

18. What is the fiber content of this top?

a. Cotton and cotton blends ☐
b. Wool and wool blends ☐
c. Synthetics ☐
d. Others ☐

II. The attributes of the outwear you worn most frequently during 30 days: (description of the outwear with picture attached)

14. How long have you owned this outwear?

a. Less than 1 year ☐
b. 1–2 years ☐
c. 2–3 years ☐
d. more than 3 years ☐

15. How much did this outwear cost (RMB)?

a. 200 and below ☐
b. 201–500 ☐
c. 501–1000 ☐
d. 1001–2000 ☐
e. 2001 and above ☐

16. What is the brand of this outwear? _____

17. What is the type of this outwear?
a. jackets ☐
b. Suits ☐
c. Overcoats ☐
d. Parkas ☐
e. Others ☐

18. What is the fiber content of this outwear?
a. Cotton and cotton blends ☐
b. Wool and wool blends ☐
c. Synthetics ☐
d. Others ☐

III. The attributes of the bottom you worn most frequently during 30 days: (description of the bottom with picture attached)
14. How long have you owned this bottom?
a. Less than 1 year ☐
b. 1–2 years ☐
c. 2–3 years ☐
d. more than 3 years ☐

15. How much did this bottom cost (RMB)?
a. 200 and below ☐
b. 201–500 ☐
c. 501–1000 ☐
d. 1001–2000 ☐
e. 2001 and above ☐

16. What is the brand of this bottom? _____

17. What is the type of this bottom?
a. jeans ☐
b. Sports/knitted trousers ☐
c. Formal trousers ☐
d. Skirt ☐
e. Others ☐

18. What is the fiber content of this bottom?

a. Cotton and cotton blends ☐

b. Wool and wool blends ☐

c. Synthetics ☐

d. Others ☐

Appendix F: Interview Procedure for *Study 2*

Interview Goals:

Goal 1: To identify the main barriers and facilitators to clothing disposal for unused clothing items among Chinese female consumers of generation Y.

Goal 2: To identify the main barriers and facilitators to the usage of OCRP for disposing of unused clothing items among Chinese female consumers of generation Y.

1. To achieve ***Goal 1***, the following questions will be asked:

- Have you disposed of any unused clothing items in the last year?

1.1 If yes:

- What are the categories of your unused clothing items (including the items you have not disposed of and the items you have disposed of in the last year)?
- What made you decide to dispose of the ones in each category you disposed of in the last year?
- What are the reasons you did not dispose of unused clothing items in each category?

1.2 If no:

- What are the categories of your unused clothing items?
- What are the reasons you did not dispose of unused clothing items in each category?

2. To achieve Goal 2, the following questions will be asked.

2.1 If the interviewee has disposed of unused clothing items in the last year:

- Which disposal channels did you use to dispose of the unused clothing items in the last year?

2.1.1 If the interviewee has used OCRP:

- Why did you choose to use OCRP?

2.1.2 If the interviewee has not used OCRP:

- Why did not you not choose to use OCRP?

2.2 If the interviewee has not disposed of unused clothing items in the last year:

- Which disposal channels have you used in the past?

2.2.1 If the interviewee has used OCRP:

Why did you choose to use OCRP?

2.2.2 If the interviewee has not used OCRP:

Why did not you not choose to use OCRP?

Appendix G: Thematic Analysis Approach Adapted from Braun and Clarke (2006)

Steps	Contents
1. Familiarization with data	Engaging in repeated readings of the data to develop a deep familiarity with its content
2. Coding	Generating concise labels (codes) that identify significant features of the data that are relevant to addressing the research questions. This process entails coding the entire dataset and subsequently organizing all the codes and relevant data extracts together for later stages of analysis.
3. Searching for themes	Examining the codes and compiled data to identify significant overarching patterns of meaning (potential themes). This process includes gathering relevant data related to each potential theme, allowing for a thorough exploration and assessment of the viability of each candidate theme.
4. Reviewing themes	Evaluating the candidate themes against the dataset to ensure they present a convincing narrative that addresses the research question. During this phase, themes are typically refined, which may involve splitting them, combining them, or even discarding them if necessary.
5. Defining and naming themes	Conducting a comprehensive analysis of each theme, delving into the scope and focus of each theme, and determining the 'story' behind it. This process also entails selecting an informative name for each theme.
6. Writing up	Integrating the analytical narrative and data extracts, while providing contextualization of the analysis in relation to existing literature.