

# Design Guidelines for Accessible Dining Apparel for the Visually Impaired: Toward Inclusive and Sustainable Fashion

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## Abstract

This study is to address the lack of targeted research on accessible clothing for the visually impaired. In response to this gap, we conducted a mixed-methods study involving in-depth interviews, questionnaire surveys, real-world experiments with visually impaired participants to examine their specific clothing needs during meals, and Market investigation. Based on the analysis of over 70 sample cases, the main challenges were identified as color recognition, stain detection, garment cleaning, functional design, and personalization. Meanwhile, we identify core design requirements for accessible bibs, including stain-resistant materials, ergonomic structures, and aesthetic considerations tailored to users preferences. This paper contributes empirical insights and practical guidelines to support inclusive design in sustainable fashion, offering a theoretical foundation for future development of accessible clothing for the visually impaired.

*Keywords:* Visually Impaired; Accessible Design; Sustainable Fashion; Design Requirements

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## 1 Introduction

Sustainable fashion and development have gained growing public attention. In this context, barrier-free design has emerged as a key trend in the development of China's fashion industry, as well as globally. Wang Yingying [1] pointed out that solving the development problems of the fashion industry is the fundamental purpose of the research on sustainable fashion design methodology; Gu Yanqin [2] proposed that sustainable design is intended to guide and satisfy consumer demands and to maintain the continuous satisfaction of the demands. Based on demographic data from China's sixth national population census (National Bureau of Statistics, 2011) and the second national sample survey of persons with disabilities (China Disabled Persons' Federation, 2010), the proportion of persons with disabilities in the total population and the distribution of different disability categories were systematically analyzed. The results show that by the end of 2010, the total number of disabled individuals in China was approximately 85.02 million, accounting for 6.34% of the national population. The World Health Organization reported that the

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number of the visually impaired in China has reached more than 17 million [3]. According to the report, the number of visually impaired in China occupied 38 percent of the total number in the world, and still growing at a rate of 20 percent per year [4]. Secondly, in terms of legislation, the Law of the People's Republic of China on the Construction of Barrier-Free Environments has been implemented to provide legal protection for the construction of barrier-free environments in the context of aging populations [5]. Accessibility, as a concrete implementation of sustainable fashion in adaptive clothing, has become urgent and crucial, while promoting the integration of sustainable fashion concepts and adaptive clothing design. This integration addresses the practical needs of the visually impaired reinforces, thereby driving industry-wide innovation.

Research related to accessible clothing mainly focused on the physically challenged group, while the needs of the inclusive design have not yet been adequately studied. Scholars such as Ding Hongyue [6] proposed the principle of pervasive design by analyzing the characteristics of the visually impaired population; Yuwen Taman [7] et al. initially explored the effects of clothing on the physiology and psychology of the people with disabilities; Luo Yimin [8] et al. systematically elaborated on the development of the national standard of Touch Graphic Design Guidelines and Legends as well as the content of the standard. Zhang Yannan et al. [9] conducted apparel design in terms of logos, colours, styles, and craftsmanship. He Jiatao further expanded the scope of accessible clothing design by introducing a framework that integrates functionality, aesthetics, and psychological comfort across instinctive, behavioural, and reflective levels [10]. All the above studies focused on the functionality, physiological, and psychological impact of clothing and logo designs. However, a significant gap remains in research on the needs of adaptive accessories for people with disabilities and their functionality in specific scenarios, such as dining, which constitutes a substantial portion of daily life (e.g., 7.2 hours on average). International studies have explored the general clothing needs of visually impaired individuals [11] and reviewed smart wearables for mobility and sensing support [12]. Although studies have been conducted on the life portraits of visually impaired individuals [13], research on clothing accessories in specific daily scenarios has received little attention. However, little attention has been paid to clothing accessories in specific daily scenarios. This study focuses on dining—an activity that involves frequent contact with garments and presents hygiene challenges—and, based on empirical needs analysis and observational insights, proposes user-centred design guidelines for accessible bibs while further extending previous research through product investigation and style analysis [14].

The purpose of this paper is to investigate the adaptive clothing accessory needs of individuals with visual impairments, with a specific focus on dining-related requirements. First of all, four types of research were conducted: in-depth interviews, questionnaire surveys, dining scenario experiments, and Market investigations, and it was found that the visually impaired had certain obstacles in the areas of color recognition and matching, detecting, and cleaning of dirty clothing in the dining scenes, and it still needs to make more efforts to develop the functional and practical designs of clothing, clothing marking and structure, and personalization and aesthetic expression, and so on. Then, based on the research results, we summarised the requirements of the visually impaired for accessible bibs in dining scenarios.

## 2 Methods

The research on accessible bibs for the visually impaired was conducted in four methods, namely, in-depth interviews, questionnaire surveys, dining scene experiments and Market investigations.