The Perceptual Evaluation of Clothing Sustainable Color in Clothing Design ⋆

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Abstract

To investigate the aesthetic preferences of consumers towards various sustainable colors, this study aims to assist designers in gaining a comprehensive understanding of consumers' color preferences during the development of eco-friendly clothing designs. The study begins by establishing a sustainable color matching scheme for clothing and employs the semantic difference method to select perceptual word pairs. Subsequently, a questionnaire survey is conducted to understand consumers' perceptual evaluation of sustainable colors in clothing. The study further analyzes and ranks the main factors by quantifying the perceptual evaluation and employing the grey correlation degree method. The results indicate that temperament factor, personality factor, and coordination factor are the primary perceptual factors influencing sustainable color. Among these factors, temperament exhibits the strongest correlation with the degree of liking, followed by personality and coordination. When selecting colors, designers should prioritize low brightness and low purity colors. Additionally, blue-green colors are more favored by consumers. The research findings hold significant implications for guiding designers in enhancing the quality and standard of green clothing design while meeting consumers' perceptual cognitive requirements.

Keywords: Kansei Engineering; Sustainable Color; Factor Analysis; Grey Relation Analysis

1 Introduction

Since China officially proposed the dual carbon goal of achieving carbon peak in 2030 and carbon neutrality in 2060 at the 75th United Nations General Assembly in 2020, there has been a noticeable increase in the number of Chinese consumers becoming more environmentally conscious. They are actively choosing a sustainable lifestyle to reduce pollution and embrace a low-carbon way of life. Enterprises also align themselves with national policies and consumer demand by investing additional resources in the design and development of sustainable products. According to a study published in 2013 on the current situation and prospects of sustainable consumption in China, 79% of respondents expressed a significant level of concern regarding sustainable consumption behavior [1]. Clothing products that are based on the concept of sustainable design are

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likely to receive significant attention and recognition in the market. The research report from the American Center for Popular Color Research reveals that color plays a significant role in consumers' decision-making process when it comes to the three major clothing elements of style, color, and fabric. Color accounts for approximately 67% of consumers' consumption decision-making, making it a crucial factor that influences their behavior [2]. When designing sustainable clothing, designers primarily select colors based on natural and popular colors. However, there is currently a lack of research on the perceptual evaluation of sustainable colors in clothing design and color matching. Therefore, it becomes crucial to comprehend consumers' perceptual evaluation of sustainable colors and their needs. This understanding can assist designers in creating products that align better with consumers' aesthetic preferences. By doing so, these products can enhance consumers' perceived value and facilitate sustainable consumption behavior at the design level.

Currently, the academic research on sustainable color primarily focuses on the natural color and natural dyes, with limited studies exploring the connection between sustainable color and consumers' emotional value from the perspective of consumer demand. Kansei engineering is a technical method that involves the application of quantitative data to product design through the measurement and quantification of human psychological characteristics [3]. Initially utilized in the realm of industrial design, this technology has now extended its reach to encompass the design of clothing fabrics [4], styles [5, 6], and colors [7, 8]. Existing research on clothing color using Kansei Engineering primarily focuses on developing algorithm programs based on consumer needs [9] or screening consumer preferences [10, 11]. However, there is a lack of in-depth studies that can provide designers with clear design suggestions. Grey correlation analysis is a method used to assess the significance of a factor sequence by comparing the similarity or dissimilarity between a small sample factor sequence and the geometric shape of the variable curve [5]. In Kansei engineering for clothing, most studies utilize factor analysis to determine the perceptual factors. However, there is a lack of research focusing on the significance of these perceptual factors. Based on Kansei engineering, this paper will study the perceptual psychology of consumers brought by different colors. Through the analysis and summary, the perceptual factor is determined. Through the grey correlation analysis, the perceptual factor is related to consumer psychology, and the important perceptual factor is determined. The purpose is to provide a certain reference value for the choice of color in the sustainable design of clothing to better assist consumers in the design level to complete the sustainable consumption behavior of clothing.

2   Methodology

2.1   Design Elements Selection

2.1.1   Principles of Selecting Color Samples

The use of different colors in clothing can evoke various emotional responses in consumers. By exploring the application of sustainable colors in clothing, we can effectively communicate the concept of sustainable design. Additionally, sustainable colors often consist of low saturation hues, which minimizes the environmental impact of the printing and dyeing process [12-14]. When consumers perceive natural colors, it stimulates their visual senses and encourages them to connect with the beauty of the natural environment, thus awakening their green perceived value [15]. The