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A study on the significance of the human senses (five senses) in fashion design

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Abstract: As a bridge for human interaction with the outside world, clothing design must not only meet the basic functional needs but also be able to trigger and satisfy people's emotional needs. From the perspective of emotional expression, the emotional experience in clothing design can enhance consumers' emotional value, thereby increasing the added value of clothing. This illustrates the importance of considering the five senses in fashion design. The objective of this paper is to analyze the significance of the five senses to fashion designers and to investigate the influence of the five senses on cutting-edge fashion design..

Keywords: Five Senses; Multi-sensory Concept Design; Smart Textiles

Introduction

The proposal and application of the five senses design concept reflect the design field's emphasis on human subjectivity and the combination of aesthetics and needs[1]. This design concept is not only limited to the visual arts but extends to tactile, auditory, olfactory, and other sensory areas. Consequently, enabling fashion design can provide a richer and deeper user experience. For example, by studying the symbolic, visual, and functional elements of the five senses in clothing, the application practice of multi-sensory design can be demonstrated, thereby expanding the conceptual framework of fashion design[2].

1. Definition and Importance of the Five Senses

1.1 The Definition of the Five Senses

The application of the five senses in fashion design is primarily reflected in enhancing the consumers' emotional communication and interaction through visual, auditory, olfactory, gustatory, and tactile sensory experiences, thereby improving the overall clothing experience.

Visual Experience: In fashion design, the use of color is one of the most direct visual experiences. For example, the "Five-Color View" research and its application in modern skirt design integrate the traditional five colors (yellow, red, blue, black, white) into modern skirt design, retaining the traditional connotation of colors while also meeting contemporary design needs, making the clothing both culturally profound and in line with modern aesthetics[3].

Auditory Experience: In fashion design, the auditory experiences can be enhanced by adding sound elements. For instance, some high-end brands may play soft music in stores to create a comfortable and relaxing shopping environment[4].

Gustatory Experience: Similarly, clothing itself does not have gustatory properties, but in some innovative designs, designers may consider colors or patterns associated with food to stimulate consumers' gustatory associations. Designers can use bright colors and patterns associated with food to evoke consumers' taste associations, using warm colors such as red and orange to remind people of sweet or spicy food. Or collaborate with food brands or restaurants to launch co-branded series that combine food elements with fashion design, providing a unique consumer experience; at fashion shows or brand activities, provide food that matches the clothing series, such as desserts or cocktails, allowing customers to experience the clothing while tasting delicious food; design accessories inspired by food, such as chocolate-shaped necklaces, candy-colored bracelets, etc., to evoke taste memories through tactile and visual elements. Although clothing materials themselves do not have taste properties, designers can try to use fabrics with specific scents, such as vanilla, lemon, etc., to indirectly stimulate taste associations through the olfactory experience.

Tactile Experience: In material selection, designers will choose appropriate fabrics according to different functional needs, such as soft silk for making underwear or rough linen for making outdoor clothing, to provide different tactile experiences. In addition, some designs will

also add special buttons or other tactile elements to increase the fun and interactivity when wearing.

Olfactory Experience: Clothing itself has no olfactory properties, but as technology evolves, smart textiles can integrate mechanisms for releasing fragrances, such as activating fragrance release through temperature changes or the wearer's movements, providing personalized olfactory experiences for wearers. Some brands may develop their own unique fragrances as part of brand recognition. This fragrance can be used in clothing, accessories, and even branded spaces to reinforce brand memory points. Olfaction is strongly linked to memory and emotion. Specific fragrances can evoke people's good memories or emotional experiences, thereby increasing emotional dependence on clothing.

1.2 The Importance of the Five Senses in Fashion Design

The importance of the five senses in fashion design is reflected in how they collectively influence the perception, experience, and expression of clothing. Fashion design is not merely a visual art; it also encompasses a multidimensional experience that includes touch, hearing, smell, and even taste. By integrating these sensory elements, designers create garments that resonate emotionally with both the wearer and the observer. The use of the five senses can elicit emotional empathy and psychological responses. Colors and patterns can evoke emotions, the texture of fabrics can provide a comfortable tactile sensation, sound can add a sense of dynamism, and even scents can evoke memories. These elements work together to shape the overall feeling of the clothing. The author has summarized the effects of the five senses in fashion design and the considerations for designers, as seen in Table 1.

Table 1 Summary Table of the Impact of the Five Senses in Fashion Design

Sensory Experience	Function	Designer Considerations
Visual	Attracts attention through color, patterns, shapes, and lines to convey style and emotions	Color coordination, pattern design, tailoring structure, visual guidance
Tactile	The texture, thickness, and elasticity of the fabric affect the comfort and durability of the clothing	Fabric selection, skin sensitivity, adaptability to wearing occasions
Auditory	The sound of clothing friction or accessories adds a sense of dynamics, creating an auditory experience	Material selection, decorative element design
Olfactory	Specific fabrics or fragrances add a unique scent, evoking emotional memories	Use of fragrances, fabric treatment, emotional associations
Gustatory	Clothing in contact with food or conveying food imagery, evoking gustatory associations	Cultural considerations, festival-themed design

The five senses in fashion design not only enhance brand image and consumer experience, but also achieve a balance between emotion and function, and drive design innovation, bringing new opportunities for the development of the fashion industry. By considering the five aspects of vision, hearing, touch, smell, and taste comprehensively, a richer and more three-dimensional brand image can be created.

Visual Design: By using specific colors, patterns, and materials, designers can leave a deep impression on consumers visually. For example, Jin Jian Clothing uses Chinese elements as the core visual elements for brand image redesign. Through eye-tracking experiments and affective semantic survey questionnaires, the brand image design most favored by consumers was ultimately selected.

Auditory Design: Fashion brands can provide a unique auditory experience for consumers when they enter the store or come into contact with products through music or sound effects.

Tactile Design: By using different fabric textures and textures, the tactile experience of consumers can be enhanced. For example, high-end fashion brands may use soft silk or rough leather to convey the luxury or uniqueness of their brand.

Olfactory Design: Fragrance is an important means for brands to convey emotions and atmosphere. Some fashion brands may use specific perfumes or scents in the store to enhance the consumer's shopping experience and leave a lasting memory.

Gustatory Design: The direct application of gustatory design in the fashion industry is relatively rare, but some brands may provide samples in their product packaging or in-store to allow consumers to taste and experience the brand's unique flavor, especially in fashion brands related to food.

The in-depth exploration and innovative use of the five senses allow designers to create distinctive clothing works, achieve differentiated design, and meet the market and consumer demand for personalization and innovation.

2.Multi-sensory Concept Design

The application of the "multisensory" concept of recognizability can enhance the identifiability of clothing. This is achieved by leading with consumer attention and incorporating tactile, auditory, olfactory, and gustatory sensory information expression methods into clothing through new techniques and technologies, thereby satisfying consumers' curiosity. The recognizability of clothing can be used to enhance the cultural connotation of the brand, making it more personalized. Multisensory clothing better conveys the emotional content of the clothing and transmits the concept of clothing product design through the joint action of vision, touch, hearing, and taste. Interactivity plays a role in the psychological response process when consumers shop, which is generally: attention, interest, desire, memory, and action. The specific process is: to attract attention, inspire desire, enhance memory, and lead to action. Multisensory clothing usually has good interactivity, which can guide consumers from noticing to being interested in clothing products, from interest to wanting to own, and ultimately to take action. Therefore, the multisensory concept can make clothing products more charming in design.The core of multisensory design lies in integrating various sensory experiences such as vision, hearing, and touch to enhance the user experience and market competitiveness of the product. This design concept not only focuses on the functionality and practicality of the product but also emphasizes emotional design and the emotional experience of the user. In terms of technological innovation, the application of intelligent sensing technology and augmented reality technology provides new possibilities for multisensory design. Intelligent sensors can collect and analyze environmental data and human behavior, realizing the call, expansion, and amplification of the user's perceptual system, bringing new sensations. Augmented reality technology enhances the user's sense of immersion and interactivity by combining the virtual with the real.

With the development of technology, the multi-sensory concept has gradually been applied in various industries, creating an environment with multiple sensory stimuli to enhance the perceptual ability and cognitive function of the experiencer, thereby increasing the attractiveness of the product. The multi-sensory concept advocates the use of multiple senses such as vision, hearing, smell, touch, proprioception, and vestibular sensation in the learning process or design process, to promote learning efficiency, enhance product experience, and attract consumer attention. According to a study, when consumers purchase a certain type of product, visual senses account for 58% of the influence, smell accounts for 15%, hearing accounts for 11%, and taste and touch account for 3% and 25%, respectively. This shows that multi-sensory design has a significant effect in attracting consumer attention and increasing the desire to purchase. Similarly, in fashion design, designers often need to capture consumers' attention in the face of a huge clothing market, not only by simple clothing design, but also by using multi-sensory concepts in the selection of clothing materials, clothing colors, clothing crafts, the interaction between clothing and the human body, and the testing of human functions to design products. In 2021, Patricia Cornelio and others published "The Application of Multisensory Fashion Communication Media in Impression Management," which, from the perspective of multisensory stimulation, mentioned two innovative fashion accessories in the literature - sound perfume and light perfume. Sound perfume combines auditory and olfactory stimulation and focuses on the display function of impression management through eye contact technology. This design not only enhances personal image management when users communicate face-to-face with others but may also affect their perception of themselves and others. Light perfume uses visual and olfactory stimulation and combines mirror interaction technology, targeting the emotional function of impression management. These design cases demonstrate how multisensory stimulation can enhance user experience and self-expression[5].In 2021, Gan Zhinan published "Research on Optimization Method of Outdoor Interactive Advertising Visual Effects Assisted by New Media Technology and Big Data Analysis," which uses new media technology and big data analysis to optimize the visual effects of outdoor interactive advertising according to consumer behavior and preferences, making it more attractive and improving the memory rate[6]. It can adjust the combination of color, text, and graphics by analyzing a large amount of user data to better attract the target audience. With the development of technology, outdoor advertising has changed from the traditional static form of expression to a more dynamic and multi-dimensional display. The application of new media technology has brought new possibilities to outdoor advertising design, allowing advertising to innovate in sound, color, and shape, and even interact with the audience. This transformation requires designers to consider various factors in the design process,

such as the size of the advertisement, the proportion of the pattern, the integration of the background color with the advertising content, and the lighting requirements of the installation location.

In this era of rapidly advancing technology, the transmission of multisensory signals in everyday life has painted a picture of the representative technological advancements for each primary sense, which the author has summarized and analyzed for vision, hearing, touch, smell, and taste (see Table 2). In each section, emerging technologies and their benefits to individual sensory modalities are first introduced, that is, using different technologies as modules for research involving multiple senses.

Table 2 Summary Table of the Benefits of Emerging Technologies for Individual Sensory Modalities

Sensory Modality	Technology	Stimulus	Multisensory Integration Advantages	Reference Studies
Visual	3D volumetric display	Depth	Visual content can be heard and felt, providing 3D cues in the real world	Hirayama et al., 2019
Auditory	Acoustic lens and metamaterials	Directionality	Audio signals can be felt and used to orient and manipulate objects in visual displays, offering free navigation	Norasikin et al., 2018, 2019
Tactile	Focused ultrasound	Non-invasive 3D tactile sensation	The generated sound waves can produce tactile sensations and can also be heard, easily integrated into visual paradigms	Carter et al., 2013; Martinez Plasencia et al., 2020
Olfactory	Wearable olfactory technology	Portability and body responsive-ness	Portability makes it easy to integrate with other multisensory technologies, allowing on-demand delivery outside the laboratory environment	Amores et al., 2018; Wang et al., 2020
Gustatory	Levitating food	Sterile, non-invasi-ve	Can be integrated with visual, olfactory, auditory, and tactile stimuli in 3D space, enabling manipulation of food trajectories	Vi et al., 2017b, 2020

The exploration of multi-sensory design in fashion design has not only adopted a new design concept but also developed the multi-aspect and multi-level sensory functions of consumers in fashion design, making the expression of clothing more abundant. The importance of the five senses in clothing design is reflected in many aspects: it can not only enhance the emotional value of consumers and strengthen the interactivity and experience between the design product and the audience, but also open up new design opportunities through the application of technology. Fashion designers should pay more attention to the value and significance of the five senses in design to achieve the combination of art and technology, and meet the modern consumers' pursuit of high-quality life experience.

3.Technology and Clothing

Against the backdrop of technological development, the application of digitalization and technology has also opened up new opportunities for the design of the five senses. The innovative integration of the five senses with clothing is an important direction currently explored by both the fashion and technology industries. By using technological devices to transform human senses into design materials, new artistic expressions can be explored, and this method has been applied to fashion design. This indicates that with the continuous growth of technological capabilities, the application of the five senses in design is also a trend in the development of future design. The concept of five-sense design emphasizes the importance of vision, hearing, smell, taste, and touch in product design. This design philosophy is not limited to traditional visual aesthetics but attempts to create a richer and deeper user experience through the integration of multiple senses. In fashion design, this means that designers need to consider how to stimulate and satisfy consumers' five senses through the clothing itself, thereby enhancing the wearing experience and emotional connection.

At present, smart clothing has become an important field of research. These garments not only have the functions of traditional clothing but also integrate sensors, data processing, and communication technology, capable of perceiving environmental changes or human conditions and responding accordingly. For example, smart clothing can monitor physiological parameters such as heart rate and body temperature, providing health information feedback to the wearer. In addition, smart clothing can interact with the outside world through integrated sensors and actuators, such as automatically adjusting temperature and color changes to adapt to different emotional states. Moreover, there are also innovative developments in materials and technology; for example, by using special textile materials and processes, clothing with

specific tactile sensations, odors, or visual effects can be created. Furthermore, interdisciplinary cooperation has also brought new inspiration and possibilities to fashion design, such as combining art, neuroscience, and human-computer interaction technology to develop clothing that can trigger specific perceptual and emotional responses.

In real life, user-designed products are gradually becoming mainstream, gradually replacing mass production. For consumers purchasing clothing, in addition to considering the comfortable and aesthetic wearing experience, they also consider the possibility of "dressing the same". At this stage, more and more people are no longer pursuing "celebrity style" products, but are more focused on the personalization of clothing and their own feelings about fashion design[7].

In 2021, Van Tienhoven and others published an article titled "The Affect of Fashion: An Exploration of Affective Method", in which the design method uses 3D body sensing technology to generate 3D human body models, and the component combination technology of fashion design can generate various clothing. Finally, by aligning and 3D registering the 3D model with the clothing, users can view the implementation effect of the designed clothing, which will help improve the efficiency of modern fashion design. Unlike other fashions, users are more willing to change the style details of clothing according to personal preferences. This technology can accurately capture the wearer's body shape and provide data support for custom-made clothing. Through 3D body scanning, an accurate virtual model can be created, and then fashion design can be carried out on this model to ensure that the clothing fits the wearer's body perfectly [8].

As early as 2015, Carlo Massaroni et al., published an article entitled "Overview of Medical Smart Textiles Based on Fiber Optic Technology," in which the use of fiber optic sensors (FOSs) as a replacement for traditional electrical and mechanical sensors in medical applications has been widely accepted . The main advantages of FOSs include good measurement properties, small size and flexibility, and immunity to electromagnetic fields. In addition, they are suitable for textiles used in magnetic resonance imaging environments, which cannot be used by standard electronic sensors[9].

In addition, Yang Kaiet al. published an article titled "Development of User-Friendly Wearable Electronic Textiles for Healthcare Applications" in 2018, which investigated a user-friendly wearable electronic sleeve that integrates an electrode array for health monitoring (Fig1). The sleeve integrates an electrode array directly on daily clothing using screen-printing technology to optimize the user experience, including comfort, effectiveness, and ease of use. The e-sleeve will help eight stroke survivors complete functional tasks, such as hand opening and pointing through muscle stimulation[10].

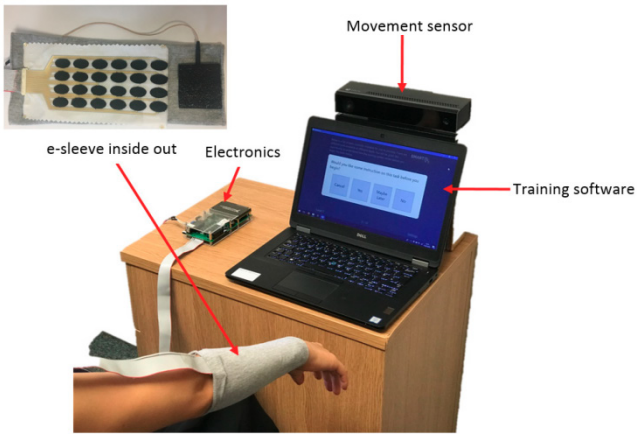

Fig 1: Development of User-Friendly Wearable Electronic Textiles for Healthcare Applications. 2018

In 2020, Tajadura-Jiménez and others published an article titled "Altering One's Body-Perception Through E-Textiles and Haptic Metaphors," in which they will use smart textiles to integrate sensors into clothing that can capture the wearer's body movements and environmental changes, thereby changing the appearance or function of the clothing(Fig 2). For example, fabrics based on 2D vibration tactile arrays can be designed to change human perception, such as simulating the feeling of weight or intensity[11].

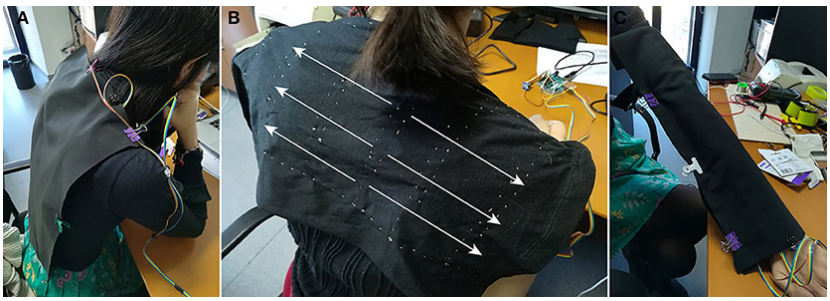

Fig 2: Altering One's Body-Perception Through E-Textiles and Haptic Metaphors. 2020

For the five senses, the development of smart textiles has brought new market opportunities for the clothing industry. As consumers' demand for smart and personalized products continues to grow, the market demand for smart textiles is also expanding. This has prompted more companies to invest in the research and development and production of smart textiles, driving innovation and progress throughout the industry.

Summary:

The importance of the five senses for fashion designers lies in their collectivet composition of the multi-dimensional experience of fashion design, which is an indispensable factor for designers in the creative process. They are not only important tools for designers to capture inspiration and conceive ideas but also a bond that connects designers with the consumers' deep hearts. Vision endows clothing with unique colors and patterns, touch brings comfortable texture and feel, and smell and hearing can evoke people's deep emotions and memories. Although the direct application of taste in fashion design is relatively limited, the associated experience it represents is equally important. The five senses are interrelated and interact with each other, jointly influencing the innovation, practicality, and comfort of fashion design.

Smart textiles have made the leap from single function to multi-sensory interaction through the application of the five senses, greatly enhancing their utility. From the intuitive display of visual information and design innovation to the automatic adjustment of tactile comfort, smart textiles provide users with personalized experiences to users while also improving their adaptability and convenience. With the continuous development of technology, we have reason to believe that smart textiles will continue to deepen and innovate in the five senses experience in the future, bringing more intelligent and comfortable wearing experiences to users.

References

[1] Zhu Lin. "Five Senses" Research in Design [D]. Shanxi Normal University, 2018.

[2] Li Yile. Research on the Application of Multi-sensory Design Elements in Clothing[D]. Sichuan Fine Arts Institute, 2021.

[3] Tang Huan. Research on "Five-color View" Based on Kansei Engineering and Its Application in Modern Skirt Design [D]. Jiangnan University, 2020.

[4] Liu Wenqiao. Application of Sensory Elements in the Image of Clothing Brand Sales Field [J]. Dachangtai, 2013, No. 297 (02): 186-187+215.

[5] Yongsoon Choi and A. Cheok. "Multisensory fashion communication media towards impression management." Int. J. Arts Technol. (2015). 364-381.

[6] Zhinan Gan and S. Tsai. "Research on the Optimization Method of Visual Effect of Outdoor Interactive Advertising Assisted by New Media Technology and Big Data Analysis." Mathematical Problems in Engineering (2021).

[7] M. V. van Tienhoven and A. Smelik. "The affect of fashion: An exploration of affective method." Critical Studies in Fashion & Beauty (2021).

[8] Zhe Yu Liu and Min Luo. "Modern Clothing Design Based on Human 3D Somatosensory Technology." J. Sensors (2022). 1-11.

[9] C. Massaroni, P. Saccomandi et al. "Medical Smart Textiles Based on Fiber Optic Technology: An Overview." Journal of Function-

al Biomaterials (2015). 204 - 221.

[10]Kai Yang, K. Meadmore et al. “Development of User-Friendly Wearable Electronic Textiles for Healthcare Applications.” Italian National Conference on Sensors (2018).

[11]A. Tajadura-Jiménez, A. Väljamäe et al. “Altering One’s Body-Perception Through E-Textiles and Haptic Metaphors.” Frontiers in Robotics and AI (2020).

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