A Study on Cheongsam (Qipao) Pattern Design for Middle-Aged and Elderly Women Based on Ergonomics and Multi-Aesthetic Perspectives

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Abstract	Original Research Article

This study focuses on the optimization of cheongsam (qipao) patterns for middle-aged and elderly women, integrating principles of ergonomics with a multi-aesthetic perspective. The aim is to enhance the adaptability of the cheongsam to the body characteristics of this demographic while addressing their diverse aesthetic preferences. Findings indicate that the body shapes of middle-aged and elderly women differ significantly from those of younger women, necessitating targeted pattern adjustments such as increasing back width and reducing back armhole depth. At the same time, incorporating diverse aesthetic elements—such as traditional embroidery techniques and modern minimalist patterns—into cheongsam design not only satisfies the aesthetic preferences of middle-aged and elderly women but also enriches the cultural value of the garment. This research provides both theoretical support and practical approaches for optimizing cheongsam design, contributing to improved comfort and aesthetic experience while promoting the inheritance and development of cheongsam culture in contemporary contexts.

Keywords: Middle-aged and elderly women, Cheongsam (Qipao), Ergonomics, Aesthetic Optimization.

1. INTRODUCTION

As a traditional garment with deep cultural roots, the cheongsam remains popular today, particularly among middle-aged and elderly women who have a special fondness for it. However, as women age, their body shapes change, and existing cheongsam designs often fail to meet their needs. From an ergonomic perspective, clothing should be closely aligned with the human body to ensure comfort and a proper fit. Additionally, in today's diverse aesthetic landscape, cheongsam designs must incorporate various aesthetic elements to cater to the personalized preferences of different middle-aged and elderly women. Therefore, optimizing the design of cheongsam patterns for middle-aged and elderly women holds significant practical importance, as it not only enhances their wearing experience but also promotes the inheritance and development of traditional cheongsam culture.

2. RESEARCH QUESTIONS

1) What are the characteristics of the body types of middle-aged and elderly women, and what challenges do these characteristics pose for the design of cheongsam patterns?

2) How can the principles of ergonomics be applied to the optimization of cheongsam patterns for middle-aged and elderly women to achieve comfort and fit?

3) How can diverse aesthetic elements be incorporated into cheongsam design to satisfy the varying aesthetic needs of middle-aged and elderly women?

3. LITERATURE REVIEW

The cheongsam, a traditional garment with profound cultural heritage, holds an important place in Chinese

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clothing history. Originating from the traditional attire of Manchu women, it evolved under the influence of Western culture in the Republic of China era into a female garment that combines traditional and modern elements (Li, 1999).The cheongsam's design, which follows the contours of the human body, showcases female elegance and reserve through various design elements such as slits, collars, and sleeves. Its evolution reflects the process of traditional Chinese clothing transforming into modern wear and carries rich aesthetic connotations and cultural value (Yang & Li, 2006). In contemporary society, the cheongsam remains popular among many women, especially middle-aged and elderly women, who regard it as an important choice for displaying their charm and cultural refinement.

In the context of accelerating global aging, the body characteristics of middle-aged and elderly women have garnered significant attention. Research indicates that with advancing age, middle-aged and elderly women experience notable body changes such as protruding waists and shoulders leaning forward (Iwazaki et al., 2005). For instance, Japan has established a trunk model for elderly women through 3D scanning technology and found that for every 10° increase in waist-to-hip ratio, an additional 5cm of ease is required in the lower garment pattern to accommodate body changes (Kim et al., 2010). These research findings provide crucial international references for optimizing cheongsam patterns.

With the advancement of age, middle-aged and elderly women undergo a series of body changes. Research indicates that middle-aged and elderly women commonly experience abdominal protrusion, sagging buttocks, broadening shoulders, and increased spinal curvature, among other phenomena (Li, 1999). These body changes make it difficult for conventional clothing patterns to meet their needs, especially when wearing a cheongsam, a garment that demands a high degree of fit. Existing clothing markets for middle-aged and elderly individuals are predominantly based on standard body types and have not adequately considered the unique body characteristics of middle-aged and elderly women. Consequently, clothing often falls short in terms of comfort and aesthetic appeal. Therefore, optimizing clothing patterns based on the body characteristics of middle-aged and elderly women has become an urgent issue to address.

Ergonomics is a discipline that studies the physiological and psychological characteristics of humans and their relationship with product design within human-machine-environment systems. In the field of clothing design, the application of ergonomics helps achieve comfort and fit in garments. By precisely measuring human body dimensions, analyzing the morphological characteristics of various body parts, and studying human movement patterns during different activities, scientific evidence can be provided for clothing pattern design. This enables clothing to better conform to the contours of the human body and meet the demands of human activities. In cheongsam design, applying ergonomic principles can lead to optimized adjustments in key areas such as the collar, shoulders, back, and waist, thereby accommodating the body characteristics of middle-

aged and elderly women and enhancing wearing comfort and fit.

Aesthetic concepts evolve with the development of society and culture, exhibiting a trend of diversification. In the realm of clothing, consumers with different ages, regional backgrounds, and cultural upbringings have varying aesthetic preferences regarding style, color, patterns, and other aspects. Middle-aged and elderly women also have diverse aesthetic requirements. On one hand, they value the traditional beauty of clothing and wish to preserve the cultural essence and classic elements embodied in cheongsam. On the other hand, they pursue a sense of fashion and modernity, desiring to showcase their individuality and vitality through clothing. Therefore, incorporating diverse aesthetic elements into cheongsam design, such as integrating traditional and modern patterns, employing innovative color schemes, and drawing on clothing styles from different cultural backgrounds, can meet the varied aesthetic needs of middle-aged and elderly women. This makes cheongsam more contemporary and appealing.

Based on ergonomic principles, the optimization of cheongsam patterns should focus on precise measurement and analysis of the dimensions and morphological characteristics of various body parts, with ergonomic data permeating the entire design process. For instance, according to the characteristics of middle-aged and elderly women, such as forward neck inclination and outward shoulder displacement, adjustments can be made to the collar and shoulder structures of cheongsam. This enables it to better conform to the natural contours of the human body, reducing the sense of constraint and discomfort during wearing, and enhancing the fit and functionality of the garment. The development of intelligent technologies has also provided new solutions for customized clothing. 3D human body scanning technology can rapidly and accurately acquire human body dimension data, laying the foundation for personalized customization. Parametric design systems optimize pattern parameters through algorithms, achieving efficient design and production. For example, domestic scholar Ren Meiling developed a parametric design algorithm for cheongsam patterns, establishing a Y/A/B body type database through VB language with a virtual fitting matching rate of 89%, significantly improving customization efficiency (Ren, 2020).

In recent years, some scholars have begun to focus on the issue of optimizing cheongsam patterns for middle-aged and elderly women and have achieved certain research outcomes. Research has found that there are significant differences between the body types of middle-aged and elderly women and those of younger women, which directly affect cheongsam pattern design. For instance, middle-aged and elderly women tend to have a more pronounced protrusion of the abdomen, requiring greater space in the front abdominal area of the cheongsam. This can be achieved through adjusting the position of the side seam line and optimizing dart designs. Characteristics such as broader shoulders and increased spinal curvature necessitate the redesign of shoulder structures and the width of the back to ensure the

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comfort and fit of the cheongsam when worn. Some studies have proposed methods for adjusting cheongsam patterns based on human body measurements, such as widening the back, reducing the depth of the rear sleeve cap, and adjusting the position and shape of darts (Li, 1999).

In terms of aesthetics, some studies have also explored how to integrate modern design elements with traditional cheongsam to meet the aesthetic needs of middle-aged and elderly women (Wang, 2015). However, current research still has some limitations. First, the sample size is relatively small and primarily concentrated in specific regions, making it difficult to comprehensively represent the body characteristics and aesthetic preferences of middle-aged and elderly women. Second, research methods are relatively limited, primarily relying on theoretical analysis and simple experiments, with a lack of in-depth empirical research and case studies. Additionally, research on the comprehensive application of ergonomics and diverse aesthetics in the optimization of cheongsam design is not yet sufficiently in-depth or systematic, and a mature design theory and methodology system has not yet been established.

4. RESEARCH METHODS

This paper employs literature research and case study methodologies. It uses 3D human body scanning technology to quickly acquire body shape data of middle - aged and elderly and women establishes a database. Meanwhile, it utilizes parametric design software to adjust the fitting parameters of cheongsam patterns based on the scanned data, thereby achieving rapid pattern optimization and customization. Additionally, by reviewing relevant domestic and international literature, this study gains an understanding of the research achievements and deficiencies in the fields of cheongsam design and clothing ergonomics. This provides theoretical support for this research and broadens the research perspectives. Finally, by selecting certain middle - aged and elderly cheamongs brands and styles as case studies, this paper analyzes the strengths and weaknesses of their pattern design and aesthetic elements application. It also sums up the lessons learned to offer practical references for optimizing the design plans.

5. RESEARCH PROCESS

5.1 Research on the Characteristics of Cheongsam Patterns for Middle-aged and Elderly Women

Table 1: Differences in Cheongsam Patterns between Middle-aged and Elderly Women and Young Women

Body Part	Characteristics of Middle-aged and Elderly Women	Characteristics of Young Women
Overall Silhouette	Front and side silhouettes are wider, with a larger horizontal dimension, presenting an H-shape.	Exhibits an X-shaped curve.
Neck	Neck is thicker, with greater curvature and forward inclination.	Neck is finer, straighter, with minimal forward inclination.
Shoulders	Shoulders broaden, with fat accumulation causing outward shoulder displacement. Shoulder width increases, and shoulder slope decreases.	Shoulder width is narrower, with no significant fat accumulation or displacement.
Chest	Bust circumference increases, with a tendency for chest posits.	No chest posits.
Back	Upper back curvature increases, posterior back width enlarges.	No increase in upper back curvature.

Source: Drawn by the researcher.

In this study, typical mid - aged and elderly cheongsam products were chosen for in - depth analysis of their pattern design. Compared to young women's chameleons, there are distinct differences (see Table 1). Designers have tried to adjust for mid - aged and elderly women's body characteristics, such as a larger back width and a lower back sleeve - cap depth, to accommodate the increased back curvature and enhance comfort (Tao Tieyuan, 2008). These changes have somewhat reduced the back constriction caused by traditional chameleons and achieved a better body - fitting effect.

In addition, some brands use elastic fabrics to adapt to the complex body changes of mid - aged and elderly women. This improves comfort and allows greater freedom of movement. In terms of structure, some brands have introduced the "segmented waist dart" design. Based on mid - aged and elderly women's abdominal protrusion, horizontal darts are added to the abdomen to reduce waist and abdominal compression (Li Siyu, 2021). Also, the shoulder and sleeve system has been restructured. Using shoulder forward inclination angle data, the traditional connected sleeve has been modified to a "slightly dropped shoulder + underarm

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triangular inset," which significantly improves shoulder movement freedom.

However, existing mid-aged and elderly chameleons still have many pattern design limitations. Some styles ignore certain body characteristics, such as abdominal fat accumulation and a flat buttocks, leading to problems like waist wrinkles and affecting overall aesthetics (Liu Yongmei et al., 2023). Moreover, some designs, in pursuit of beauty, overlook the practicality needs. For example, improper side slit height and position may restrict the wearer's movement.

5.2 Analysis of Cheongsam Style Characteristics for Middle-aged and Elderly Women

Table 2: Analysis of Style Characteristics of Cheongsam for Middle-aged and Elderly Women

Style	Characteristics	Application Cases
Traditional Chinese elements style	·Utilizing traditional embroidery techniques and printing technology ·Retaining classic cheongsam elements such as stand-up collars, button fastenings, and slits ·Combining modern design techniques for innovation	Incorporate Chinese cultural elements such as dragons and phoenixes, peonies, plum blossoms, orchids, bamboo, and chrysanthemums into the design, adjust the height of the stand-up collar, or innovate the shape and material of the buttonholes to make them more fashionable.
A simple and elegant style	·Use simple, flowing lines and generous shapes. ·Avoid complicated designs. Focus on straight or loose cuts. ·Choose calm, understated colors.	Available in black, dark blue, burgundy, etc., with different fabric textures and patterns to add depth and richness.
Modern fashion style	Cleverly incorporating modern fashion elements, such as asymmetrical hems, creative neckline designs (such as Peter Pan collars), or contemporary patterns,	Add abstract art patterns or geometric shapes to give cheongsams a fashionable look based on traditional designs.
Tech Digital Style	Enhancing comfort and functionality with high-tech materials such as smart fibers	Combining virtual reality (VR)/augmented reality (AR) technology for virtual try-on and personalized customization

Source: Drawn by the researcher.

The design style of cheongsam for middle-aged and elderly women combines traditional charm with modern aesthetics, forming a unique design style (see Table 2). Inheritance and Innovation of Traditional Elements As a representative of traditional Chinese clothing, cheongsam retains and inherits classic elements such as stand-up collars, buttoned closures, and slits in its design for middle-aged and elderly women. These elements not only reflect the traditional beauty of cheongsam but also highlight the unique charm of traditional Chinese culture. For example, the stand-up collar design highlights the neckline, showcasing a woman's elegant demeanor; button closures, as the traditional fastening method for cheongsam, have a high degree of recognizably and have become one of the important cultural symbols of cheongsam. In modern designs, these traditional elements are often combined with innovative techniques, such as adjusting the height of the stand-up collar to better align with modern aesthetics; or innovating the shape and material of button closures to make them more fashionable.

A minimalist and elegant style positioning Middle-aged and elderly women often prioritize simplicity and elegance in their clothing, so cheongsam designs should avoid excessive complexity, focusing instead on clean, flowing lines and generous silhouettes. In terms of style, straight or loose-fitting cuts can be adopted, which not only meet the comfort needs of middle-aged and elderly women but also flatter their figures, showcasing their elegant demeanor. In terms of color coordination, cheongsams for middle-aged and elderly women often choose steady and low-key colors, such as black, dark blue, and burgundy, which reflect the maturity and stability of middle-aged and elderly women. At the same time, different fabric textures and pattern designs can be used to add layers and richness to the clothing.

Integrating modern fashion elements to cater to middle-aged and elderly women's pursuit of fashion, cheongsam designs cleverly incorporate modern fashion elements. For example, asymmetrical hems, creative neckline designs, or modern patterns can be used. Asymmetrical hems add dynamism and a modern touch to the garment; creative collar designs, such as the combination of a Peter Pan collar with a cheongsam, blend retro charm with a fresh, modern aesthetic; in terms of pattern design, in addition to traditional floral patterns, abstract art patterns or geometric shapes are incorporated to give the cheongsam a strong modern flair while maintaining its traditional roots.

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Emphasizing comfort and functionality the design of cheongsam for middle-aged and elderly individuals prioritizes comfort and functionality. In terms of fabric selection, emphasis is placed on breath-ability, moisture-winking properties, and warmth to ensure comfort. For example, silk fabric is soft, breathable, and an ideal choice for cheongsam; blended fabrics offer good warmth and elasticity, making them suitable for autumn and winter cheongsam. In terms of structural design, emphasis is placed on the fit of the garment and ease of movement, using scientific cutting methods and reasonable design details, such as appropriately widening the sleeve area and increasing shoulder mobility, making the cheongsam both beautiful and practical.

Embracing Cultural Significance and Aesthetic Value As an important carrier of Chinese traditional culture, cheongsam design emphasizes cultural significance and aesthetic value.

By incorporating traditional embroidery techniques and printing technologies, Chinese cultural elements such as dragons and phoenixes symbolizing prosperity, peonies symbolizing wealth, and the Four Gentlemen (plum blossoms, orchids, bamboo, and chrysanthemums) are integrated into cheongsam designs, making them visual symbols for disseminating Chinese culture. These patterns not only possess high artistic value but also reflect the cultural literacy and aesthetic taste of middle-aged and elderly women.

In the future, the design of cheongsam for middle-aged and elderly people can further integrate technology and fashion, utilizing high-tech materials such as smart fibers to enhance comfort and functionality. At the same time, virtual reality (VR)/augmented reality (AR) technology can be combined for virtual try-on and personalized customization, driving the innovative inheritance of cheongsam culture in the digital age.

5.3 Optimization Proposal for Cheongsam Patterns for Middle-aged and Elderly Women

Table 3: Optimization Proposal for Cheongsam Patterns for Middle-aged and Elderly Women

Body Part	Structural Characteristics	Revision Measures
Neck and Back	Slow growth of neck root circumference, forward neck inclination; increased spinal curvature, thickened shoulder and back fat	Enlarge the rear straight collar opening, reduce the front straight collar opening; moderately enlarge the rear horizontal collar opening
Shoulders	Reduced front and rear shoulder slopes, flatter shoulders; increased shoulder forward displacement	Reduce shoulder slope angle, increase front chest ease
Back	Larger back width than young women, smaller front-back waist difference, longer back length	Enlarge back width, reduce rear sleeve cap depth
Chest	Increased bust circumference, chest ptosis, chest protrusion increase exceeds that of other directions along the bust line	Increase chest dart amount to make the front chest curved surface conform to the naturally draped chest contour
Waist and Abdomen	Significant abdominal fat accumulation, waist circumference increase mainly concentrated in the front	Adjust waist dart distribution ratio (40% to 60% or 30% to 70%); use curved front waist darts and straight rear waist darts
Hips	Obvious abdominal protrusion, flat buttocks, chest-hip difference distribution shifted forward	Lift the front hip line by 1-1.5cm, reduce rear hip dart amount to 1.8-2.2cm; expand front side seam line outward by 0.3-0.5cm

Source: Drawn by the researcher.

In pattern design, despite some optimization efforts by certain brands of cheongsams for middle - aged and elderly women, there's still significant room for improvement. For instance, many designs fail to effectively address the common abdominal fat accumulation and flat buttocks of middle - aged and elderly women. The existing waist darts don't adequately account for abdominal protrusion, causing wrinkles during wear and affecting aesthetics (Liu Yongmei et al., 2023). Also, the side slit height and position of some chameleons are illogically designed, restricting movement and reducing comfort (Li Siyu, 2021). Therefore, in - depth

research on the body characteristics of middle - aged and elderly women and targeted pattern optimization are crucial for improving the fit and aesthetics of chameleons (see Table 3).

To better meet the needs of middle - aged and elderly female consumers, cheongsam brands need to consider body characteristics, aesthetic requirements, and pattern comfort. First, in pattern design, the special body features of middle - aged and elderly women should be fully considered. For example, adjustments like increasing the back width and reducing the back sleeve - cap depth can accommodate the

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increased back curvature (Tao Tieyuan, 2008). Second, in aesthetic design, diverse elements should be integrated.Traditional cultural connotations should be retained, while modern simple patterns and color matching are incorporated to meet different consumers' aesthetic preferences (Li Siyu, 2021). Finally, parametric design and virtual try - on technology can be used to achieve precise customization, improving comfort and fit (Ren Meiling, 2020).

In conclusion, by comprehensively analyzing the body characteristics, aesthetic requirements, and pattern comfort of middle - aged and elderly women, cheongsam brands can optimize product design, enhance market competitiveness, and better meet consumer needs. This not only promotes the inheritance of traditional clothing culture but also drives the innovative development of cheongsams in the modern fashion field.

6. DISCUSSION

6.1 The Impact of Body Shape Characteristics of Middle-aged and Elderly Women on the Optimization of Cheongsam Silhouettes

Research has found that the body shapes of middle-aged and elderly women differ significantly from those of younger women, and these differences directly influence the design of cheongsam silhouettes. For example, middle-aged and elderly women tend to have more pronounced abdominal protrusions, requiring cheongsam designs to provide greater accommodative space in the front abdominal area. This can be achieved through adjustments to the position of side seams or optimization of dart designs. Characteristics such as broader shoulders and increased curvature of the back necessitate redesigning the shoulder structure and back width to ensure the comfort and fit of the cheongsam.

Based on ergonomics principles, the optimization of cheongsam patterns should emphasize precise measurement and analysis of the dimensions and shapes of various body parts, integrating ergonomic data throughout the design process. For example, based on the characteristics of middle-aged and elderly women, such as forward-tilted necks and outward-shifted shoulders, adjustments should be made to the collar and shoulder structure of the cheongsam to make it better fit the natural curves of the human body, reduce the feeling of constraint and discomfort during wearing, and enhance the garment's fit and functionality.

6.2 Application Strategies of Ergonomics in Cheongsam Pattern Optimization

Based on ergonomic principles, in the optimization design of cheongsam patterns, it is essential to focus on the precise measurement and analysis of the dimensions and shapes of various body parts, integrating ergonomic data throughout the entire design process. For example, based on the characteristics of middle-aged and elderly women, such as forward-tilted necks and outward-shifted shoulders,

adjustments should be made to the collar and shoulder structure of the cheongsam to better align with the natural curves of the human body, reducing the feeling of constraint and discomfort during wear, and enhancing the garment's fit and functionality.

6.3 Integration of Diverse Aesthetic Elements in Cheongsam Design for Middle-Aged and Elderly Women

To meet the diverse aesthetic needs of middle-aged and elderly women, cheongsam design can integrate various aesthetic elements such as traditional and modern, Eastern and Western. In terms of style, while retaining classic elements of traditional cheongsam such as stand-up collars, button closures, and side slits, modern design elements like clean lines and loose silhouettes can be incorporated to give the cheongsam a more fashionable and contemporary feel. In terms of color and patterns, considering the age characteristics and aesthetic preferences of middle-aged and elderly women, colors that are steady yet vibrant can be selected. Traditional patterns with auspicious meanings and abstract modern art patterns can be used to enrich the visual effects of cheongsam, meeting the personalized aesthetic needs of different consumers.

7. CONCLUSIONS

Through research on the body characteristics of middle-aged and elderly women, combined with ergonomics and a multi-perspective aesthetic approach, this study explores the optimization of cheongsam patterns for middle-aged and elderly women. The study draws the following conclusions:

Middle-aged and elderly women have unique body shapes, and the design of cheongsam patterns must fully consider these characteristics. Targeted optimizations and adjustments should be made across multiple areas, including the neck, shoulders, back, chest, waist and abdomen, and hips, to achieve both comfort and a proper fit.

Applying ergonomics principles to cheongsam pattern optimization provides a scientific basis for design, making the cheongsam more aligned with human physiological characteristics and enhancing the wearing experience. From measuring body dimensions to adjusting pattern structures, ergonomics is integrated throughout all design stages, serving as a crucial foundation for achieving cheongsam pattern optimization.

Incorporating diverse aesthetic elements into cheongsam design can meet the varying aesthetic needs of middle-aged and elderly women, making the cheongsam more contemporary and appealing. The fusion of traditional and modern, Eastern and Western aesthetic elements provides a rich source of creativity for cheongsam design, contributing to the inheritance and innovative development of cheongsam culture.

Future research could expand the sample size to include middle-aged and elderly women from different regions and

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cultural backgrounds to gain a more comprehensive understanding of their body characteristics and aesthetic needs. Additionally, further research into the application of new fabrics and manufacturing techniques in cheongsam for middle-aged and elderly women could enhance the quality and performance of cheongsam, providing more valuable references and insights for cheongsam design targeting this demographic.

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