

A brief review of clothing comfort for plus size senior women

Abstract

This work directly relates to the doctoral research titled “*Adaptation of Clothing for Elderly Women Dependent on Care, Considering Their Anatomical Modifications*,” conducted in 2017 at the University of Minho, Portugal. The study aims to present adaptable clothing suggestions, emphasizing comfort features to suit the physical and postural conditions of plus-size elderly women. The term “plus-size” in this article refers to the bodies of elderly women classified as overweight or obese according to medical standards. Observations were made regarding posture, movement, and the time spent in a seated position by plus-size elderly women. These observations could significantly contribute to material recommendations and clothing adaptations, focusing on sensory, thermophysiological, psychological, and, more specifically, ergonomic comfort. The research adopts a descriptive and qualitative approach with conceptual reviews, highlighting authors such as Hoff (2016), Li (2001), Zhang (1992), Slater (1985), Gill (2011), Romeo (2013), Aires (2019), among others, who support the study with suggestions on materials, methods, and techniques that enhance product comfort. In conclusion, the study emphasizes comfort in various aspects: ergonomic comfort through body-fitted modeling; sensory comfort through the fibers and soft touch of the fabric; thermophysiological comfort regarding warmth and coolness; and psychological comfort through the aesthetic function of clothing, highlighting the beneficial effect that color triggers on the behavior of plus-size elderly women. The relevance of the topic in the current context is also underscored.

Keywords: comfort ergonomic, plus-size body, inclusive clothing

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Introduction

Old age brings not only challenges and difficulties but also benefits and compensations that are reflected in the wisdom and experiences gained over a lifetime. However, societal perceptions often associate aging with illness, vulnerability, and waiting for death, despite recent research proving otherwise. Advances in healthcare technology, improved socioeconomic conditions, better control of preventable diseases through immunization, and increased awareness of healthier eating habits and physical activity have contributed to the enhanced health profile of elderly individuals.¹

The *International Plan of Action on Ageing* by the United Nations (2003), approved at the First World Assembly on Ageing in April 2002 in Madrid (Spain), led to the publication of a political declaration comprising nineteen articles. Each article underscores the implementation of effective measures to address challenges and promote the well-being of individuals entering old age. With the global aging population, there is a growing emphasis on accessibility, inclusion, and health to ensure a better quality of life for the elderly.

In this context, research has focused on developing solutions tailored to the needs of this demographic. This particular study addresses plus-size elderly women, presenting suggestions aimed at solving issues related to clothing comfort. It considers the anatomical changes their bodies undergo during aging, placing them outside the parameters of traditional body standards.

Elderly women and physical body changes

Throughout life, individuals undergo continuous physical transformations, aging, and experiencing significant changes from birth to death.² As people age, their bodies undergo changes such as an increase in fat mass, weight fluctuations, loss of height, skin texture

alterations, and muscle and bone loss (Baumgartner et al., 1991).^{3,4} These changes occur more rapidly in women after menopause, often leading to a noticeable accumulation of fat in the hips and legs.⁵

Old age brings about direct effects on the body, including physiological changes, the onset of diseases, and physical limitations. Despite modern medical resources such as plastic surgery, medication, and advanced treatment technologies, the body inevitably transforms. Twigg⁶ remarks that “aging imposes a false mask over the self, hindering individuals’ ability to be and express who they truly are,” highlighting the growing disconnect between self-perceived identity and bodily changes.

From a postural perspective, elderly individuals often experience long-term issues, such as spinal deformities. According to Iida,⁷ there are three primary body postures: lying down, standing, and sitting. Sitting, defined as a position in which the body’s weight rests on a surface,⁸ becomes problematic when maintained for extended periods, as it can lead to physical deformation. Over time, human posture and everyday body movement patterns reveal symptomatic alterations in body shape.

Some researchers assess sitting posture based on spinal curvature. Pynt, Higgs, and Mackey⁹ identify “flexed sitting posture” as a condition where the natural lumbar curvature is reversed, causing kyphosis. Callaghan and Dunk¹⁰ and O’Sullivan et al.¹¹ describe an upright lumbopelvic sitting posture, where the pelvis, lumbar lordosis, and thoracic kyphosis remain in neutral alignment. With aging, body configurations tend to change, sometimes significantly, leading to modifications and even deformities.

Ashdown et al.¹² confirmed these variations by applying anthropometric adjustments using body scanning technology on 49 women aged 34–55 in standing and sitting positions. They observed a

significant increase in hip circumference in the seated position, which underscores the need for more ergonomic lower-body clothing for plus-size elderly women.

Examining the elderly body's structure and how it interacts with clothing reveals a dynamic relationship between actions and movements. Unlike younger individuals whose bodies remain closer to standard proportions, the elderly face challenges due to clothing's inability to adapt to their transformed bodies, failing to act as a seamless extension of the wearer.

These transformations require designers to give extra attention when creating products for this demographic. For clothing, factors such as fabric texture, seams, layering, and the type and number of stitches demand careful consideration. Advances in textile and apparel technology allow for the integration of comfort, functionality, and protection into garments. The physical changes of the body, especially those falling outside the fashion industry's "ideal" standards, present opportunities for innovation. This study focuses on plus-size elderly women, whose specific body areas undergo significant changes, highlighting the potential for tailored clothing solutions that better meet their needs.

Clothing designated as "outside the standard"

According to Hoff,¹³ a body "outside the standard" is considered different because it deviates from ideals of beauty, health, and youthfulness. Within this framework lies the body of elderly women, often associated with deformed, obese, or physically and mentally disabled individuals, as well as those suffering from illnesses (e.g., anorexia, AIDS) or possessing ethnic traits not represented by hegemonic beauty standards. Hernández,¹⁴ referencing Bergenheim (1986), describes such profiles as belonging to marginalized groups, who face difficulties adapting to standard clothing (produced with standardized measurements by the industry for broad market applicability).

From this perspective, a "standard" serves as a model to which everyone is expected to conform¹⁵ and acts as a basis for comparing population data. Beyond the scarcity of research addressing the "outside the standard" demographic, there is a notable lack of adaptable products that meet their physical needs. Individuals classified as marginalized often struggle to find clothing when their body dimensions do not align with standard sizes (Bergenheim, 1986).

Some individuals face exceptional challenges in finding suitable clothing, such as those with deformities that affect balance. For instance, bodies with asymmetries causing imbalance often cannot harmonize or adapt to conventional clothing. Forced by circumstances, such individuals typically resort to wearing sizes larger or smaller than necessary, depending on the body's dimensions and modifications.¹⁶

A basic understanding of how to adapt designs to accommodate bodily modifications is therefore crucial. Hernández¹⁴ explored this topic in her research on constructing patterns for unique figures, particularly those with significant deformities, using equipment, adaptation methods, and software to streamline the process and account for body variations.

Hernández¹⁴ also cites earlier works addressing "outside the standard" audiences. Gamwell (1966) investigated the clothing preferences of individuals with disabilities, noting that they desire not to appear different from others in their social group, regardless of age, gender, or financial situation. Rosenblad-Wallin (1977) emphasized the importance of adjustment techniques in clothing design for elderly individuals, aiming to simplify dressing. Benktzon (1993) studied

garments tailored to the needs of women with osteoporosis. Thorén (1994) analyzed the production of individualized clothing for people with physical disabilities and atypical body proportions, highlighting the importance of making clothing a personal and empowering experience for individuals with disabilities or disfigurements.

Although new segments are emerging, they have been slow to attract substantial investment. Most resources are directed toward producing clothing for people with standard body dimensions. The reasons for this vary, but the result is a persistent difficulty in providing rapid solutions for adaptable clothing options for diverse body types. This scenario underscores a pressing need to shift the dynamics of the clothing market. Despite limited availability, some options do exist for "outside the standard" populations, including plus-size adults and children, individuals with limited mobility, and disabled elderly individuals, among others.

Despite the steady emergence of specialized clothing projects worldwide, there remains a significant demand for further research and innovation. This gap highlights opportunities for new ideas and advancements in various segments of the market.

Clothing and the basic requirements of comfort

In this research, focusing on elderly women with larger body sizes who are more vulnerable due to psychological and physiological manifestations affecting their body performance suggestions for clothing design emphasize the selection of basic requirements to achieve desired comfort. Saltzman¹⁷ highlights that clothing plays a unique role compared to other daily-use products, given its extensive interaction with the wearer's body. Uncomfortable clothing immediately affects the user's quality of life and interferes with their sensations and perceptions.

Suggestions for adaptable clothing for bodies considered "outside the standard," being a daily-use product, involve continuous and dynamic interaction during wear, generating responses to mechanical, thermal, and visual stimuli.¹⁸ These sensations, integral to the conditions of comfort, arise during the product's conceptualization and, depending on its design, can either provide comfort or discomfort to the user.

According to Zhang,¹⁹ comfort or discomfort can be categorized into two dimensions: comfort, associated with relaxation and well-being, and discomfort, linked to biomechanical factors and fatigue. Slater²⁰ views comfort as an affective state-abstract and subjective producing physical, physiological, material, and psychological well-being. This state is influenced by environments, objects, sensations, and situations that evoke positive feelings. These factors are deeply connected to the relationship between humans, clothing, and their surroundings, underscoring the need to ensure appropriate physical conditions for individual well-being.

Material research for selecting raw materials, particularly the main fabric, must align with essential characteristics to ensure the proposed product's functionality. The fabric should be evaluated for its effects on the final product, considering its properties and undergoing basic quality control tests to ensure it meets the expected performance.²¹ Key factors include weight, thickness, drape, cut, and elasticity, all of which can determine whether clothing is perceived as a success or failure.

Technological advancements have introduced significant benefits to textiles and clothing, enhancing physical and chemical fabric properties especially softness and tactile comfort. Modern textiles

now include features such as antimicrobial properties, high moisture absorption, quick drying, and ease of maintenance (washing, drying, and ironing). These attributes contribute to flexibility and ease of use, without compromising mobility, touch, or handling.

One notable technique for enhancing textile functionality is incorporating microcapsules into fibers. These provide properties such as water repellency, insect and dirt resistance, odor control, moisturization, and antimicrobial effects, making them suitable for a wide range of garments, including pants, socks, undergarments, and gloves.²² Anita et al.²³ emphasize how such fabric improvements protect users from bacteria and disease transmission while offering defense against fungi, yeast, and other microorganisms like dust mites.

Thus, based on the four basic conditions of comfort-ergonomic, sensory, thermophysiological, and psychological this research suggests processes for developing more inclusive and appropriate clothing for larger bodies. These include considerations for freedom of movement, functional ease of wear, adaptability to modified bodies, mobility during dressing and undressing, and the handling of closures. Comfort factors such as the feel of accessories, seams, and finishes, as well as fabric softness, flexibility, and lightness, also play crucial roles. Additionally, the aesthetic functionality of the garment and material characteristics that support the design's quality are fundamental.

To improve clothing comfort for individuals who spend significant time seated, Caldas¹ measured the hip circumference of 30 Brazilian and Portuguese women, differing in age, height, and weight, in both standing and seated positions using a flexible tape measure. The study revealed an average hip circumference increase of 5.8 cm when seated and noted that these differences were not proportional to the hip size. These findings served as parameters for adjusting the lower parts of garments, accounting for this expanded hip circumference when seated.

Suggestions for adapted clothing for elderly plus-size women

This study emphasizes recommendations for adapting clothing to meet the needs of elderly women who wear plus sizes, focusing on improving comfort. These adaptations involve specific considerations in material selection, patternmaking, and construction techniques, among other features that contribute to creating more comfortable garments.

Key features for adapted clothing:

1) Material and notion selection

- a) **Fabrics:** The structure and texture of the fabric should provide thermophysiological and sensory comfort. Materials must be lightweight, flexible, and suitable for climate conditions, enhancing thermal regulation and sensory comfort in communal or everyday environments.
- b) **Notions:** Fasteners, zippers, and other details should be ergonomic, easy to handle, and avoid causing discomfort when in contact with the skin.

2) Patternmaking adjustments

- a) **Ease allowances:** Defining the appropriate amount of ease for each pattern is crucial. It determines how much space the garment allows for movement, ensuring interactive comfort between the clothing and the body. Patterns must be carefully evaluated to balance comfort and proper fit for both static and dynamic body positions.

- b) **Body conformity:** The design should accommodate physiological changes associated with aging, such as kyphosis (curvature of the upper spine), a lower bust position, and increased abdominal and hip dimensions. Attention to these features ensures the garment conforms to the body's natural shape and balance.

- c) **Balance:** The clothing lines should align with the body's center of gravity, maintaining proper fit and appearance during movement or rest.

3) Construction techniques

- a) **Seams and finishing:** Internal seams should be concealed to prevent irritation, and finishing techniques should enhance durability and comfort.

- b) **Functional details:** Openings, fasteners, necklines, and sleeves should be designed for practicality and ease of use, especially for elderly individuals with limited mobility or dexterity.

Considerations for plus-size elderly women

As women age, physiological changes such as an increased curvature of the spine (kyphosis), a lower bust position that merges with the abdomen, and a rounded body shape become more prominent. These changes often include a narrowing of the front body and widening of the back due to spinal deformation. Additionally, a significant portion of elderly women is overweight, with abdominal fat accumulation more common among women (52.1%) compared to men (21.8%) according to Brazilian health data.²⁴

These changes heavily influence patternmaking, requiring adjustments to ensure garments align with the body's natural shape and movement. Gill²⁵ and Romeo²⁶ highlight the importance of accommodating body shape changes, muscle expansion and contraction, and ease of dressing to ensure a garment fit both functionally and aesthetically.

Garment construction recommendations

During garment construction, key aspects to address include:

- a) **Seam types:** Use flat-felled or concealed seams to avoid external irritants.
- b) **Functional components:** Openings, fastening systems, necklines, and sleeve designs must account for ease of dressing and undressing, particularly for elderly women who spend significant time seated.
- c) **Customization:** Consider the user's physical and psychological state when designing these features to optimize comfort and usability.

By integrating these adjustments into clothing design, it is possible to create garments that not only provide comfort but also enhance the quality of life for elderly plus-size women. Examples of these adaptations are illustrated in Figure 1, showcasing practical design solutions for this demographic.

In relation to neckline types, the recommendation is to design them with a broader cut at the shoulders, both in shape and depth, to allow the insertion of accessories for certain types of collars, ensuring comfort during use.

Regarding sleeves, it is important to consider the movement of the upper limbs when dressing and undressing, as well as the comfort they provide when they meet the arm, which often predisposes to a greater

accumulation of fat. For sleeves, comfort should be considered based on the user's movement of the arms. The movements of each part of the body should be observed, avoiding seam and cut placements over areas with higher repetitive movement, especially in regions with greater muscular activity.



Figure 1 Examples of trims, seams, and finishing suggestions.

Source: CALDAS, A. L. *Adequação do Vestuário para Idosas Dependentes de Cuidados, Considerando a sua Modificação Anatômica*. University of Minho - Portugal, 2017. PhD Thesis. Image obtained through copy in the document.

More unique suggestions involve models with sleeves, such as the Raglan sleeve (which has a diagonal cut that extends to the neckline), a type of sleeve that allows greater heat release from the body compared to traditional sleeves with the armhole at the shoulder. This sleeve model moves the armhole from the shoulder joint to the neckline through a diagonal line. Another sleeve option, the kimono sleeve, shifts the armhole seam from the shoulder to below the triceps, the upper arm muscle (Figure 2 shows examples of these suggestions). These hybrid sleeves do not make direct contact with the shoulder joint, aiming to reduce friction caused by seam contact during the movement of the upper limbs.¹



Figure 2 Examples of hybrid sleeve suggestions.

Source: Image produced by the authors themselves (2021).

All adaptations and modifications should be executed proportionally. These values should be introduced flexibly, varying according to each specific situation, taking into account the drape and fit on the body.

Regarding the increase in hip size when sitting, the suggestion is to adapt the lower part of the garment, both in skirts and pants, by enlarging the back contour to accommodate the expansion of the hips. To illustrate with a more inclusive model, in terms of differentiating body sizes, consider the adjustment applied to pants for plus-size elderly women, where the design can be tailored using button closures with buttonholes and wide pleats (Figure 3 shows an example). Freedom of movement provides comfort, stemming from a proper calculation of ease values distributed in certain areas of the body, such as the hips.



Figure 3 Example of a tailored pants model in progress.

Source: Image produced by the authors themselves (2021).

Still focusing on comfort, when it comes to the use of buttons in clothing for elderly individuals, depending on their location, buttons tend to cause sensory discomfort when in contact with the skin. In the development of the research for this target audience, it was not possible to find buttons in the market that met the desired characteristics of flexibility, lightness, and softness. Therefore, it was necessary to develop a new type of button, starting with the first prototypes using a 3D printer (Prusa 13 model) and a flexible filament material called thermoplastic elastomer (TPE) – an adhesive and elastic material.

Due to technical issues, which varied depending on the calibration of the equipment used for printing, it was necessary to consult a company to develop the flexible button in the required shapes. The material used for the button (Figure 4 shows an example) is composed of polyvinyl chloride (PVC), commercially known as Plastisol L/100 Bianco Ral 901. This plastic material contains plasticizing additives such as phthalates and has a viscous liquid appearance.¹



Figure 4 Button suggestion demonstrating its flexibility.

Source: CALDAS, A. L. *Clothing Suitability for Elderly Women Dependent on Care, Considering their Anatomical Modification*. University of Minho-Portugal. 2017. Doctoral Thesis. Image obtained through copy in the document.

Final considerations

As a person ages, there is a tendency for various health conditions to emerge. In some cases, prolonged periods of inactivity lead to extended sitting postures. This inertia may contribute to obesity, with an increased accumulation of fat in certain areas of the body, especially in elderly women who are larger in size. These women, often having greater stature, tend to get tired more easily, requiring them to spend more time seated. In such cases, this prolonged sitting can cause structural changes to the body.

Aires²⁷ highlights that clothing is designed to modify the body of the wearer, either accentuating or restricting specific parts visibly, even if not permanently. This technique, applied through certain textile materials, methods, and techniques used in garment construction, can create optical illusions that emphasize “perfections” or conceal certain “imperfections” of the body. The author stresses that “the ideal body in fashion is a cultural construct that has changed over time to emphasize different shapes and proportions.”

This study focused on the interactive proportionality between the body and clothing. Therefore, future body modeling methods must adopt more specific and sensitive approaches, allowing for a realistic definition of garment modeling in relation to the body's shape.

The results of this research contribute to disseminating valuable information aimed at a growing and underserved population. It aims to socially contribute to inclusion and quality of life in old age, with the goal of achieving accessible design that caters to the needs of specific individuals.^{28–31}

Conclusion

It is important to emphasize the beneficial effect that color has as psychological comfort for individuals. This factor should be considered significant in the behavior of elderly women and may serve as a basis for future studies. Color conveys messages, holds symbolism, and triggers emotional responses related to aesthetics. The visual position that color occupies presupposes knowledge of contrasts, harmonies, interactions, and perceptions, provoking reactions and reinforcing symbolic effects. Colors help draw attention, establish relationships, create contrasts, and make objects more understandable and memorable. Their perspective allows for a visual enhancement, contributing to the body's aesthetic value.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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