Toward Inclusive Fashion: Custom Clothing Patterns for Women with Lower Mobility Disabilities

By

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Abstract

The research explores the possibility of creating commercial clothing patterns that meet the needs of individuals with lower mobility disabilities, as well as the acceptance of these patterns by specialists. The aim is to design custom clothing patterns that cater to the needs of individuals with lower mobility disabilities, with a focus on assessing specialists' opinions of these patterns. The importance of the research lies in addressing neglected needs in the fashion industry, improving the quality of life, and enhancing independence and self-confidence for individuals with lower mobility disabilities. Additionally, it contributes to the inclusivity and diversity of the fashion industry. To achieve the research objectives, a descriptive methodology was followed, collecting data from fashion specialists at King Abdulaziz University using a questionnaire. The results confirmed that commercial clothing patterns can be created for both genders with lower mobility disabilities. The commercial patterns designed were well-received by the specialists. The research also recommended raising awareness about the importance of designs tailored for individuals with lower mobility disabilities.

Keywords: Fashion industry, lower limb disability, commercial patterns

Introduction and Research Problem:

In recent years, the importance of developing fashion products that meet the needs of diverse consumer groups, including women with mobility impairments, has emerged. Despite advancements in technology and design, there remains a significant market gap regarding the availability of clothing specifically tailored to meet the needs of this consumer segment. Mobility impairments can affect one’s ability to independently dress and undress, making it essential to design clothing that facilitates these actions while respecting the specific needs of the user (Chae, 2020).

The challenge lies in how to create patterns that consider the diversity in mobility impairments, providing clothing solutions that combine functionality with style. This research question necessitates an in-depth study to better understand the best approaches for designing clothing that meets these needs, focusing on the opportunities and challenges associated with creating patterns for women with mobility impairments (Andrews and Forber-Pratt, 2022).

In a world where awareness of inclusivity and equal opportunity is increasing, there is a prominent challenge in designing fashion that accommodates the needs of all users, including those with mobility impairments. Although technology and design have progressed significantly, the fashion industry still struggles to offer clothing solutions that adequately cater to the requirements of this group. This issue impacts not only the comfort and independence of

people with mobility impairments but also their self-confidence and personal expression through fashion (Garland-Thomson, 2020).

With growing calls for a more inclusive society, the research problem can be summarized by the following questions:

1. What is the feasibility of creating commercial patterns for individuals with lower-body mobility impairments?
2. How receptive are specialists to the prepared commercial patterns?

Research Objectives:

This study aims to develop clothing patterns tailored to the needs of women with lower-body mobility impairments:

1. To prepare specialized clothing patterns for individuals with lower-body mobility impairments that meet their clothing needs, with a focus on comfort and ease of use.
2. To assess the acceptance level of specialists regarding the developed patterns.

Significance of the Research:

1. To address overlooked needs in the fashion industry by providing suitable clothing options for individuals with lower-body mobility impairments.
2. To improve the quality of life for women with lower-body mobility impairments by promoting independence and self-confidence.
3. To contribute to inclusivity and diversity in the fashion industry by developing designs that consider the needs of all users.
4. To enhance innovation in fashion design through the unique challenges presented by the needs of individuals with lower-body mobility impairments.

Theoretical Framework

Lower-Body Mobility Impairment

The number of people with disabilities is increasing annually, and this annual increase is expected due to a range of factors, as indicated by the World Health Organization (2024). Globally, there are over 1 billion people with disabilities, comprising approximately 15% of the world's population (meaning one in seven individuals). The number of people with disabilities will continue to rise due to population aging and the growing prevalence of chronic health conditions worldwide. National disability patterns are also affected by health trends, environmental factors, and other causes, such as road traffic accidents, falls, violence, and humanitarian emergencies, including natural disasters, conflicts, diet, and substance abuse.

Mobility impairment is a type of disability that individuals may experience in life. A person may be born with this type of disability or acquire it due to an accident or illness. Individuals with mobility impairments experience a full or partial reduction in movement, depending on the severity of their impairment (Rawab, 2018, p.175).

Lower-limb impairments impact daily activities such as walking, standing, self-care, sitting, lifting objects, and sleeping, affecting quality of life and long-term functional outcomes. These impairments often lead to musculoskeletal pain and difficulty performing daily tasks, which in turn affect feelings of independence and result in negative impacts on mental health, employment, and overall well-being. As such, individuals with lower-body impairments may

benefit from individualized strategies to help manage pain and face the daily challenges they encounter (Jones et al., 2019, p.93).

People with disabilities face a complex range of challenges. An equality-based, human-rights approach is effective in understanding disability and improving the interaction of individuals with their environment. This approach considers the variations in abilities among individuals; however, in many countries, the prevailing perspective still leans on an inclusive or medical approach, focusing efforts on medical treatment, rehabilitation, and facilitating care for people with disabilities (Safsaf, 2021, p.202).

In summary, lower-limb impairments can affect daily life activities such as walking, standing, self-care, sitting, lifting, and sleeping, impacting quality of life and functional outcomes. They result in musculoskeletal pain, which complicates performing daily tasks. Moreover, people with lower-limb impairments face numerous complex challenges. Despite this, the predominant approach in many countries remains medical or inclusive, centering on medical treatment, rehabilitation, and care support for people with lower-body mobility impairments.

Concept of Mobility Impairment:

Various definitions describe mobility impairment in Arabic literature, which can be outlined as follows:

Rawab (2018, p.176) defines mobility impairment as "a condition in which a person has a cause that hinders their movement and vital activity due to a disorder or disability. It affects the muscles, joints, or bones, limiting normal functions and impacting the person's education and self-support."

Masabeeh (2020, p.190) describes mobility impairment as "a health and physical issue resulting from an injury or defect that wholly or partially prevents a person from performing routine tasks suitable for their status in various areas of life. It is a physical disability affecting individuals due to genetic or other factors, limiting their ability to actively participate in various activities that a typical person of the same age could perform, and manifests in different forms depending on the injury, such as paralysis or muscular weakness."

Bataniya (2020, p.8) defines mobility impairment as "a deficiency or weakness in the motor system or internal body functions, impacting an individual’s natural life and often causing feelings of inferiority. It includes amputees, individuals with fractures, burns, or chronic illnesses such as polio, rickets, or rheumatoid arthritis."

Sheikh (2021, p.108) describes mobility impairment as "a weakness in the body or a limb due to muscular atrophy or partial paralysis, leading to an inability to fully use body limbs."

Ala (2021, p.27) defines mobility impairment as "conditions in which individuals experience movement issues due to dysfunction in certain body systems, noticeably affecting mobility and productivity."

Based on these definitions, the researcher views mobility impairment as a condition that affects an individual’s movement abilities, limiting their ability to perform daily activities naturally. Mobility impairment encompasses a range of conditions that affect the motor system, including muscles, bones, nerves, and joints. It may be congenital or result from accidents or acquired illnesses later in life.

Concept of Lower-Body Mobility Impairment

Muller, Thomas, and Peat (2012, p.952) define lower-body mobility impairment as "a disability affecting movement and sensation in an individual's lower limbs."

Jabeen et al. (2016, p.348) describe lower-body mobility impairment as "a condition impacting movement and mobility in the lower limbs."

Hasan and Dhingra (2020, p.211) define it as "a temporary or permanent weakness in the lower limbs that affects individuals at some point in their lives."

The Saudi Ministry of Health (2024) describes lower-body mobility impairment as "a neurological disorder in the brain resulting in paralysis exclusively in the lower limbs."

Krakowska, Szmelcer, and Zaborna (2020, p.535) define it as "an inability of the lower limbs to function while preserving the functions of the upper limbs."

Ertem (2023, p.85) defines lower-body mobility impairment as "degrees of disability and injury in the lower limbs, resulting in an inability to move."

Accordingly, the researcher defines lower-body mobility impairment as a disability affecting the legs, feet, pelvis, and lower spine. This impairment may be due to congenital abnormalities, injuries, or diseases such as polio, cerebral palsy, diabetes, or pelvic or spinal injuries. Lower-body mobility impairment impacts the ability to walk, stand, and perform daily physical activities naturally.

Causes of Lower-Body Mobility Impairment

Mobility impairment is one of the most common types of disabilities due to the variety of common factors that contribute to its occurrence. These factors affect vital parts of the human body, particularly those involved in movement and task performance, ultimately impacting individuals' sense of confidence and independence (Al-Sayed, 2023, p.328).

According to Greve et al. (2015, p.683), the common causes of lower-body mobility impairment are as follows:

1. **Amputation**: This refers to the partial or complete loss of a limb, such as a foot or leg. Amputation can result from an accident or severe injury requiring surgical removal of damaged tissue, presenting significant challenges for movement and mobility.
2. **Fractures**: Fractures may occur due to sports or illness-related injuries, requiring medical evaluation and appropriate treatment, which may involve surgery or the use of casts.
3. **Arthritis**: This can develop following trauma or injury to the joints due to severe bruising or joint stress, causing intense pain and swelling that hinders normal movement.
4. **Joint Stiffness**: When a person loses the ability to move naturally, either partially or fully, resulting in considerable difficulty with movement and mobility.

Additionally, lower-body mobility impairment may result from other conditions, such as strokes, which impair an individual's ability to walk independently and weaken their overall physical condition. Lower-body mobility impairment can also arise from various issues, such as encephalitis, polio, spastic cerebral palsy, and autism, as these neurological conditions affect growth and neurodevelopment, leading to difficulty with lower-body movement (Yin et al., 2022, p.1). Furthermore, diabetes complications can cause lower-body mobility impairment due to diabetic neuropathy, which can even lead to limb amputation (Med, 2018, p.1297).

Rawab (2018, p.178) classifies the causes of disability in general into several categories:

- **Prenatal Factors**: Disabilities may develop due to various factors before birth, some genetic and others resulting from mutations in embryonic development. These are divided into:
    - **Genetic Factors**: Including direct hereditary factors, such as genetic diseases passed down through dominant or recessive genes, and indirect genetic factors, such as mutations during embryonic development. Examples include brain malformations, cell formation disorders, RH factor issues, and metabolic disturbances leading to intellectual disability.
    - **Non-Genetic Factors**: Factors affecting the fetus during pregnancy that are unrelated to genetics, such as rubella, syphilis, and endocrine disorders.
- **Birth Factors**: These are factors that occur during or accompany birth, such as difficult labor or oxygen deprivation (asphyxia).
- **Postnatal Factors**: Disabilities may result from various conditions affecting newborns, including rickets due to vitamin D deficiency, scarlet fever, jaundice, measles, polio, or accidents like road incidents, burns, falls from heights, and electric shocks.

Thus, lower-body mobility impairment can result from prenatal, postnatal, and external factors, such as amputation and accidents:

- **Prenatal Factors**: Include congenital deformities in the lower limbs, potentially due to embryonic developmental issues or genetic disorders.
- **Postnatal Factors**: May involve brain injuries during infancy that affect movement and muscle control.
- **External Factors**: Amputation, which represents partial or complete loss of a lower limb, often results from car accidents, workplace injuries, or other incidents. Additionally, road accidents involving cars, motorcycles, and bicycles can cause serious lower-limb injuries, sometimes leading to lower-body mobility impairment. Diseases like arthritis, rheumatoid arthritis, and psoriatic arthritis can also lead to inflammation and joint damage, making it difficult to move and perform daily physical activities.

Challenges Faced by Individuals with Lower-Body Mobility Impairment:

Lower-body mobility impairment often leads to psychological and behavioral issues, as noted by Al-Sheikh (2021, p.106). This type of impairment significantly impacts individuals' daily lives, limiting their ability to perform specific activities, move independently, or engage with society unless they can rely on their physical capabilities. Such impairments also influence individuals' cognitive development, as those with mobility impairments lack control over parts of their bodies, leading to movement limitations that result in various psychological and behavioral challenges.

Individuals with disabilities face diverse problems stemming from their physical and health conditions. A common psychological issue is the sense of inadequacy due to the body's inability to perform certain functions, which may arise from anatomical or functional issues or complete inability to work. This perception reduces the individual’s self-worth and security. Additionally, mobility impairment can cause social issues, such as leaving a job or adapting to a new role that accommodates their condition, and economic challenges, as physically disabled individuals often face unemployment. Employers may hesitate to hire them, viewing them as low-

productivity or as a burden on the organization due to the need for specific accommodations, increasing operational costs (Al-Adwan, 2014, p.14).

Moreover, physical impairments can heighten stress and create additional problems. Clothing plays a crucial role for individuals with disabilities, as inappropriate attire can lead to psychological struggles, feelings of inadequacy, and deprivation. Clothing that reduces reliance on others for dressing and undressing fosters self-sufficiency and may support treatment plans for some disabilities, such as compression garments that improve motor performance and balance for certain physical impairments. However, appropriate clothing options are often unavailable locally because production companies show little interest in developing and testing adaptive clothing, given the relatively small consumer base. Recently, however, the growing number of individuals in this group has highlighted the need for suitable designs that meet their clothing requirements, enhancing their independence (Arbaeen, 2022, p.21).

Lower-body mobility impairment can affect the motor skills of the lower limbs during various tasks, requiring individuals to rely on wheelchairs to simulate an active lifestyle. Wheelchairs are designed to facilitate human interaction by utilizing precise control systems that accommodate users' limited motor skills (Roman-Liu & Tokarski, 2016, p.464).

In summary, individuals with lower-body mobility impairments face numerous challenges, including motor issues as they struggle with muscle weakness, movement control, walking, or using their lower limbs. These difficulties affect their ability to perform daily activities, including mobility, independence, employment, and education. Psychological issues also affect those with lower-body mobility impairments, such as self-acceptance difficulties, feelings of sadness, anger, and frustration due to limited physical abilities compared to others. Providing psychological support and encouragement is essential to enhance their self-acceptance and mental well-being.

Rehabilitation for Individuals with Lower-Body Mobility Impairment:

Lower-body mobility impairment impacts the lifestyle and quality of life of affected individuals due to its social, psychological, and physical consequences. This condition can cause lower-body damage, making physical activities challenging. Therefore, individuals with lower-body impairments require suitable rehabilitation programs to minimize the effects of their impairment and strengthen their lower limbs. Rehabilitation strategies should include a range of exercises, such as breathing exercises, passive exercises for the affected limbs, and active exercises to help individuals avoid complications from lower-body mobility impairment (Dhanashree et al., 2022, p.1).

Mobility impairments often result in prolonged bed rest, leading to complications like pressure sores, muscle atrophy, organ dysfunction, edema, or osteoporosis, worsening the individual's health. To improve their quality of life, individuals should have access to supportive equipment, such as crutches and wheelchairs, which aid in movement. However, these devices are not always advanced or fully suited for individuals who have lost their mobility entirely. In addition, medical treatment is crucial for these individuals, requiring rehabilitation, individualized treatment plans, and routine physical exercises to maintain mobility (Wang et al., 2022, p.2).

People with lower limb disabilities face challenges in mobility, movement, and performing daily activities. Rehabilitation can be crucial in enhancing their quality of life and increasing their independence by focusing on improving motor skills and strengthening the functionality of the affected lower limbs. Rehabilitation plans may include exercises to build muscle strength, increase power, and endurance in the lower limbs. Assistive devices and specialized techniques are used to enhance movement and balance, with exercises aimed at improving coordination and stability. This allows individuals to develop control over their movements and improve

coordination between muscles and lower limbs (Krakowska, Szmelcer, & Zaborna, 2020, p.536).

People with lower limb disabilities can develop compensatory mechanisms to address functional deficits. Those without full use of their lower limbs can adapt and overcome challenges by enhancing rehabilitation efforts that stimulate intact sensory systems. For instance, individuals with lower limb disabilities who are impacted by spinal cord injuries can still engage in professional activities by performing tasks using their upper limbs, which require precise control. This involves exercises to strengthen the motor skills of those with lower limb disabilities (Tokarski & Liu, 2016, p.464).

The researcher believes that rehabilitation for people with lower limb disabilities plays a pivotal role in enhancing mobility, improving functionality, and increasing quality of life through specialized rehabilitation programs, as well as psychological and social support. With these, individuals can overcome challenges and lead healthy, independent lives. Rehabilitation programs rely on a team of health professionals, including physical therapists, occupational therapists, mental health specialists, and motor skills trainers. Each program is tailored to the individual's specific needs and current abilities, with progress evaluated regularly and adjustments made accordingly.

Clothing Needs for People with Disabilities

Clothing is a fundamental necessity for everyone, akin to food and drink for the average person, and its importance increases for individuals with disabilities, particularly those with lower limb impairments. This group differs from others in its characteristics, needs, and lifestyle, and clothing serves as a means of self-expression and a source of comfort. The comfort of clothing affects functional efficiency and reflects psychological and social considerations. This group has particular significance because the appearance of clothing can influence an individual’s confidence and societal acceptance. People with lower limb disabilities often strive for independence in tasks, especially dressing, and therefore require clothing that provides ease of use and autonomy. To cater to their needs, clothing designs must prioritize functional aspects to enhance wearers’ self-confidence and personal strength (Alsilmani, 2023, p.98).

The physical condition of people with mobility impairments can lead to heightened stress and complications. Clothing is a crucial need that, if not designed to serve its intended purpose, can contribute to psychological struggles, such as feelings of deprivation and dependence. Properly designed clothing can reduce reliance on others for dressing and undressing and support therapeutic plans for certain physical disabilities. However, ready-to-wear options available in local markets are not typically tailored to the specific needs of people with disabilities. Clothing companies often do not explore or test this type of clothing due to a limited consumer base, though this group is increasingly significant within society. This rising demand necessitates clothing designs that cater to their unique needs, thus promoting autonomy, independence, and self-respect (Ghalib & Najdah, 2018, p.126).

Creating patterns is a precise process crucial to the success of both design and production. Pattern designers must possess high levels of skill, experience, and talent to adapt them in various technical ways, whether as flat patterns or shaped on mannequins according to the design requirements. They must understand the human body in three dimensions. Thus, pattern design specifically addresses the needs of people with lower limb disabilities, significantly promoting independence and boosting self-confidence, thereby enhancing their social integration. Specialists in apparel and textiles must provide clothing designs that meet the needs and requirements of people with mobility impairments, offering physiological comfort, safety, and ease of dressing and undressing (Mohammed, 2023, p.1552).

In conclusion, people with disabilities face numerous challenges related to their clothing. Their needs call for clothing that provides comfort, ease of movement, and usability. Meeting their clothing needs plays a crucial role in their lives, as providing appropriate and accessible clothing enhances their quality of life, fosters independence, and boosts self-confidence. For example, adaptive clothing such as front-button shirts or zip-up garments can offer ease of wear and accessibility.

Commercial Patterns in the Clothing Industry

Patterns are one of the most fundamental elements that help execute clothing accurately; if not crafted correctly, they lead to negative results. Any mistake in the pattern creates errors that are difficult to fix. Thus, designing and implementing patterns is an innovative process that must fulfill its intended purpose. It is no longer just about teaching manual skills that anyone can perform without understanding the knowledge behind the skills (Hassan, 2017, p. 129).

Commercial patterns provide comprehensive content on design for clients, including specific usage instructions, fostering an interactive relationship with clients. This sets companies that use commercial patterns apart from traditional market channels. Commercial patterns are an effective tool for balancing aesthetics and functionality in clothing, helping achieve a balance between beauty, comfort, and practical performance. Through commercial patterns, companies can develop designs that comprehensively meet consumer needs (Sandström & Pihl, 2013, p. 1).

Therefore, commercial patterns are among the key elements that assist companies and brands in building a strong identity and enhancing client relations. Their distinctive application grants businesses uniqueness and prominence in a highly competitive market.

Definition of a Commercial Pattern

Hassan (2017, p. 137) defines a pattern as "a diagram on paper or fabric containing curved and straight lines representing body measurements; it forms the foundation for executing any design and can be created either through flat patternmaking or draping on a mannequin."

Hassanein (2019, p. 366) describes the commercial pattern as "a design prepared by specialized entities, provided in a dedicated envelope with usage instructions typically used in factories."

Przybyszewski (2021, p. 30) defines it as "precisely measured and mapped templates used in designing and cutting commercial clothing. Commercial patterns specify the required shape and measurements for each garment component, from raw fabric to detailed parts such as collars, sleeves, and pockets."

The researcher can define commercial patterns as designs created by an organization, accompanied by instructions and guidelines on how to use them and sizing information.

Importance of Commercial Patterns

Commercial patterns are an essential part of constructing clothing and serve as a vital tool for empowering companies economically. Household economics graduates can practice entrepreneurial roles and generate income through self-employment, finding fulfillment in business. The critical role of pattern makers in clothing and fashion design has been confirmed, as garments cannot be made ready-to-wear without their skills and expertise. The textile and clothing industry has opened vast job opportunities in various fields, including fabric manufacturing, garment making, textile cutting machinery operation, fashion illustration,

fashion merchandising, pattern making or designing, and clothing maintenance services. Moreover, clothing pattern specialists are the backbone of the fashion and apparel industry, as the patterns they create form the basis for manufacturing or producing final clothing products (AGNES, 2015, p. 2).

Commercial patterns have emerged as a new trend that can enhance the clothing industry and bring structure to the world of fashion. They help designers expand and market their brands, providing a robust foundation for expressing creativity and developing unique designs. They offer the basic structure for clothing, allowing creators to focus on details, embellishments, and unique designs that distinguish their products (Meng, 2022, p. 6).

In conclusion, the significance of commercial patterns supports the clothing industry by aiding designers in expanding their brands and developing unique designs. They provide the structural foundation for clothing, allowing creators to focus on details and unique designs while delivering detailed information.

History of Commercial Patterns

Commercial patterns date back to the mid-20th century when individuals interested in fashion began collaborating to create suitable clothing for everyone. The history of commercial patterns stretches to the pre-industrial revolution, undergoing remarkable evolution over time. Initially, cutting and sewing clothes were done manually by skilled artisans using basic models or simple templates to cut and assemble fabrics. With technological advancements and the rise of the textile industry, commercial patterns began to emerge (Adelova, Dewi & Suherni, 2023, p. 19).

In the 19th century, calculators were introduced to develop commercial patterns, converting measurements into cuttable templates. At this time, commercial patterns were primarily made from cardboard or lined fabric. In the early 20th century, new production methods for commercial patterns appeared, including using computers and software for more precise and efficient design. Electronic patterns became common, enabling storage and sharing online. Recent decades have seen significant transformations in the commercial pattern industry due to modern technologies like 3D modeling and 3D printers, which can create complex and precise patterns that were previously impossible (Liu, Qin & Zhang, 2022, p. 153).

Additionally, commercial patterns assist haute couture in addressing daily challenges. They offer more detailed insight into design measurements by providing clear sewing guidelines and presenting detailed illustrations of garment construction. Consequently, commercial patterns provide valuable information about clothing (Przybyszewski, 2021, p. 32).

In summary, commercial patterns emerged in the mid-20th century when fashion enthusiasts collaborated to create appropriate clothing for all. Their history dates back to pre-industrial times and has undergone significant development over the years. In the 19th century, calculators were used to develop commercial patterns, made from cardboard or lined fabric. The 20th century introduced new methods like computer and software use for more accurate and effective pattern design. Recent advancements in 3D modeling and printing technologies allow for the creation of complex and precise patterns, enhancing the industry.

Design Requirements for Clothing for People with Lower Limb Mobility Disabilities:
Clothing plays a critical role in individuals' lives, fulfilling essential physiological needs, providing comfort, and protecting against external elements. Additionally, clothing influences our preferences and behavior, serving as a medium for self-expression and social positioning. The human body undergoes constant changes, making the selection of appropriate clothing crucial. For individuals interacting with the elderly or people with lower limb mobility disabilities, specialized clothing can help conceal physical challenges and create a particular image, aiding communication and integration. This fosters self-confidence, comfort, a positive presence, and social connections (Antonela, Viorica & Laura, 2014, p.281).

Clothing for people with disabilities must meet essential requirements and should be tailored in areas like sleeves, back, and shoulders to allow for increased freedom and comfort, especially considering wheelchair movement. Fabrics should avoid wrinkles, minimize unnecessary fabric in the back, prevent tightness around the knees, and eliminate unnecessary pockets. Garments should avoid sewn hems at the lower pant legs. Additionally, adaptive clothing should fulfill requirements such as moisture absorption, use of flexible fibers for comfort, easy closure systems, and materials that prevent heat retention (Bogović & Nakić, 2019, p.24).

According to Poonia (2020, p.240), several characteristics should be considered when designing clothing for people with mobility disabilities:

- **Aesthetic Quality:** Well-designed clothing helps overcome various challenges.
- **Comfort:** Garments should be made from fabrics close to the body to avoid discomfort, ensuring insulation and ventilation.
- **Protection:** Fabrics should protect from environmental risks, such as rain, wind, and cold, even indoors.
- **Ease of Movement:** The fabric must allow easy movement for people with disabilities, without restricting body motion.
- **Closure Placement:** Easy-to-access openings for independent dressing and undressing are essential.
- **Fit:** Ensuring proper fit through the relationship between garment size and wearer's measurements.
- **Durability:** Clothing should withstand tension, wear, and tear for long-term use.

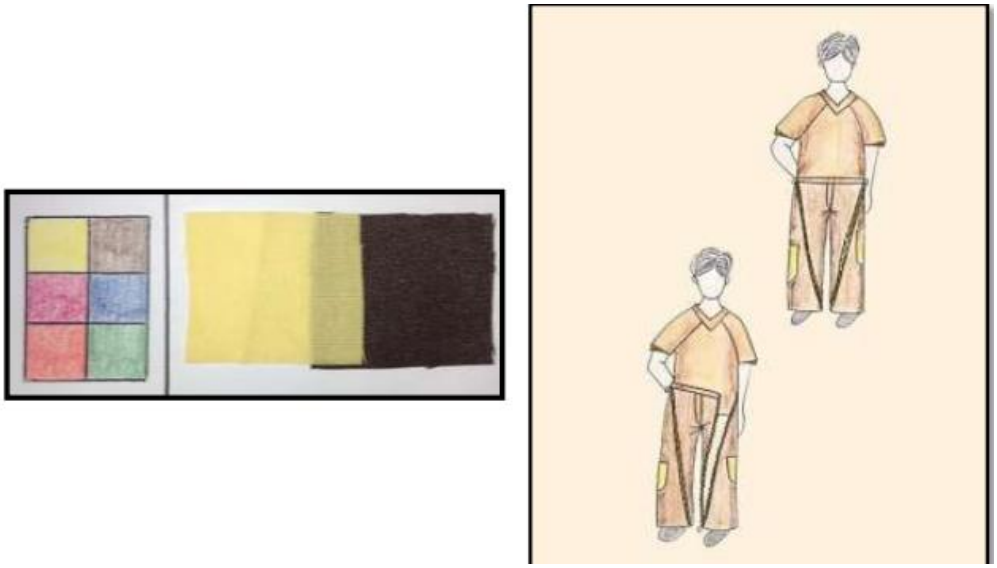


Fig 1: Proposed design for suitable clothing for individuals with lower limb disabilities (Nasr, 2018, p. 140).

Fig 2: Proposed design (2) for suitable clothing for individuals with lower limb disabilities (Al-Sulaimani, 2023, p. 114).

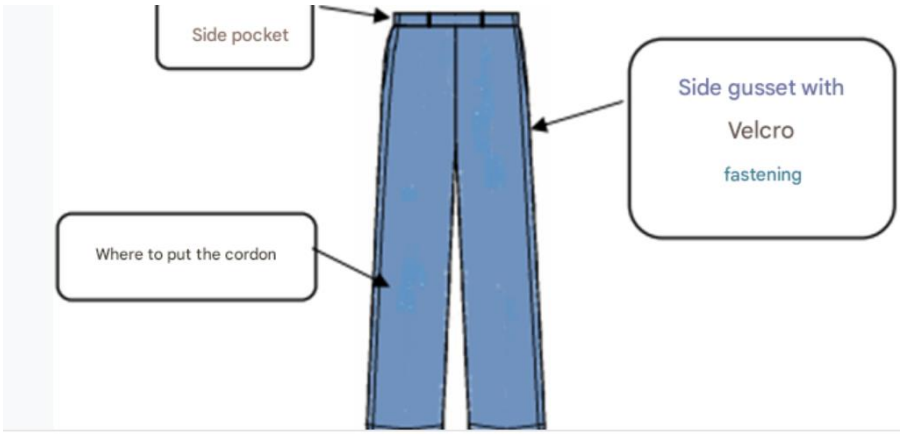


Fig 3: Proposed design (3) for suitable clothing for individuals with lower limb disabilities (Tawros, 2014, p. 695).

In response to the above, designing clothing for individuals with lower limb disabilities requires special attention to meeting their needs and providing comfort and ease of movement. These needs present unique challenges to the clothing industry. However, with the right design and the use of appropriate techniques, this can be successfully achieved through the following:

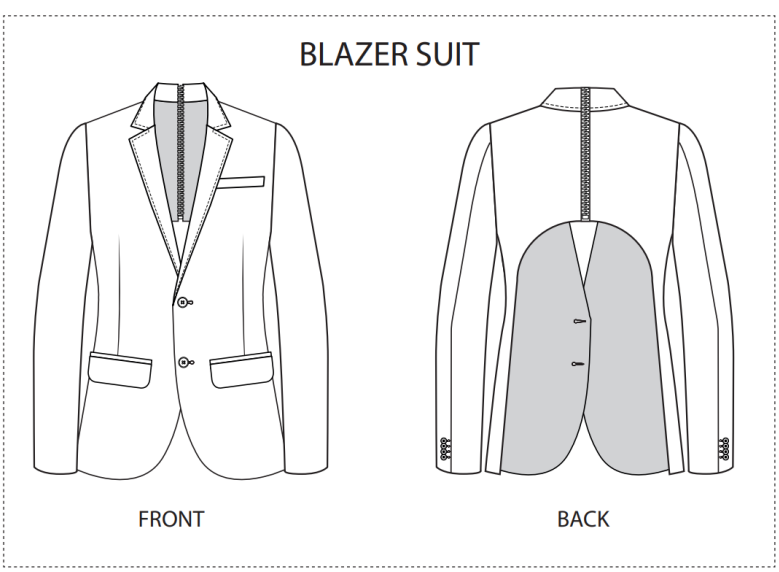
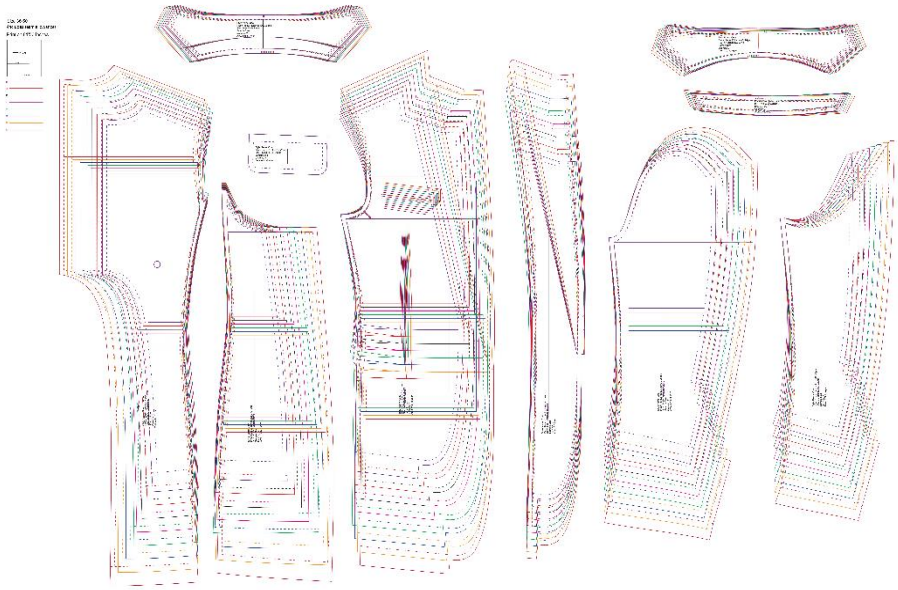
- **Ease of Dressing and Undressing:** Adding snap buttons or easily opened zippers, along with wide openings for legs and feet, facilitates sitting and standing positions.
- **Flexible Fabrics:** Use stretchy fabrics to allow body movement without excessive restriction, such as elastic or ribbed materials.
- **Comfortable Cuts:** Designs should be loose enough to enable leg movement and avoid friction or excessive heat.
- **Good Ventilation:** Incorporate breathable fabrics to allow air circulation and prevent overheating. Moisture-absorbing materials can enhance comfort.
- **Support Features:** Additional support for legs or feet may be needed, with internal pockets to hold medical devices like prosthetics.
- **Stylish and Attractive Design:** Designers should focus on making adaptive clothing elegant and appealing through the use of colors, patterns, and details that enhance personal style.

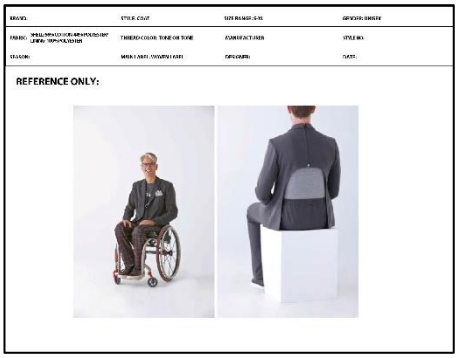
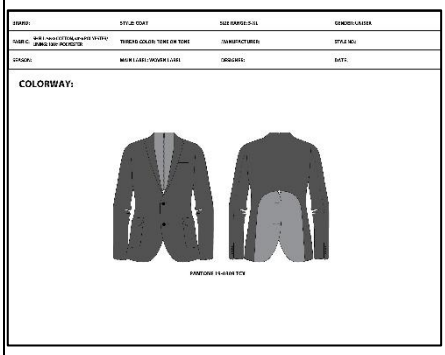
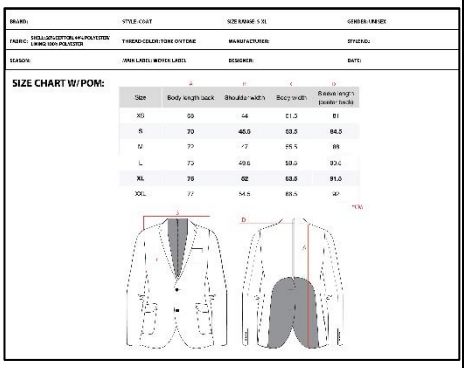
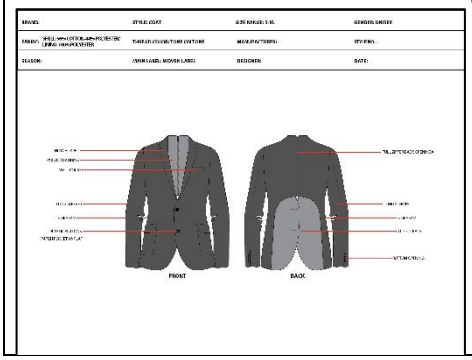
Practical Application of the Study:

As part of improving quality of life and contributing to community service, the researcher selected a range of essential clothing pieces for people with lower limb mobility disabilities. Patterns for these pieces were created using Optitex, a specialized software for industrial pattern design that enables multi-size pattern creation. Supplementary software, such as Adobe Illustrator, was used to create flat garment designs, which were then imported into Optitex. Additionally, the PLT program was employed to enhance the quality of pattern printing by separating sizes and nesting them on fabric in a professional industrial manner.

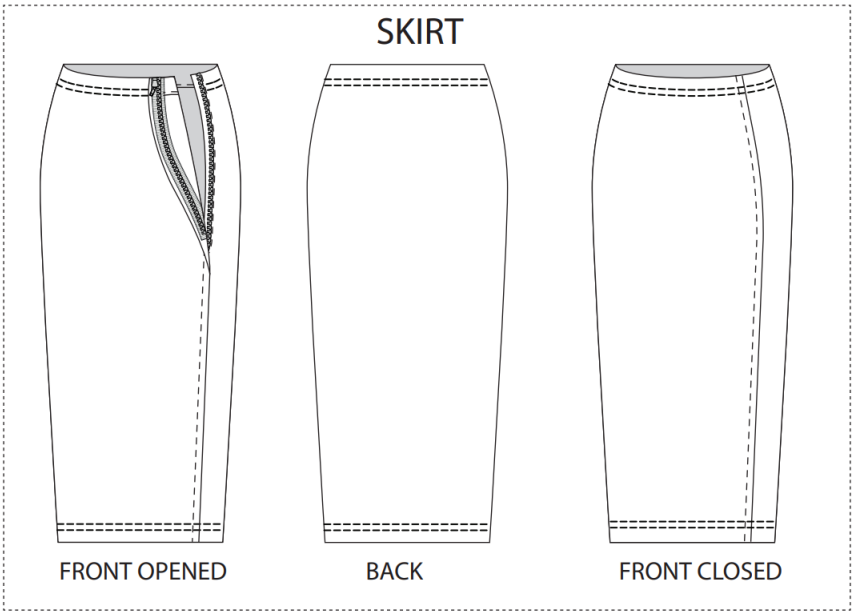
Nine different pieces of clothing, including outerwear and undergarments, were chosen from websites specializing in adaptive clothing for people with disabilities. The table below provides an overview of each piece, including images, descriptions, patterns, and production instructions.

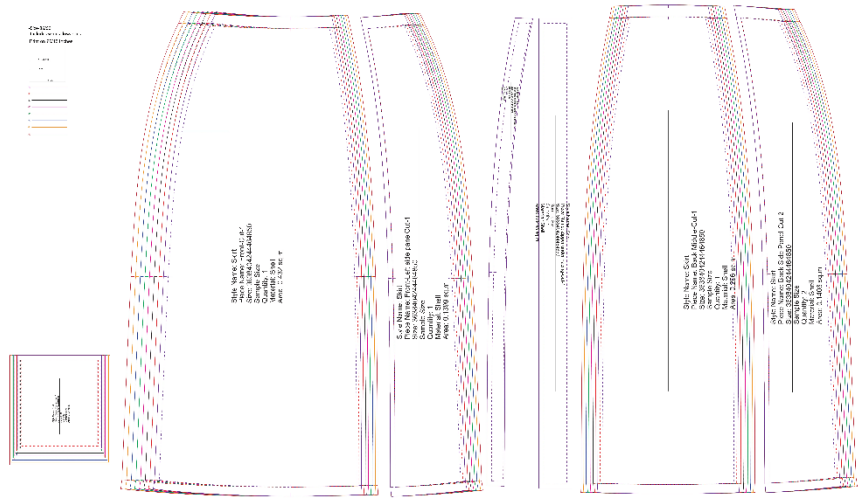
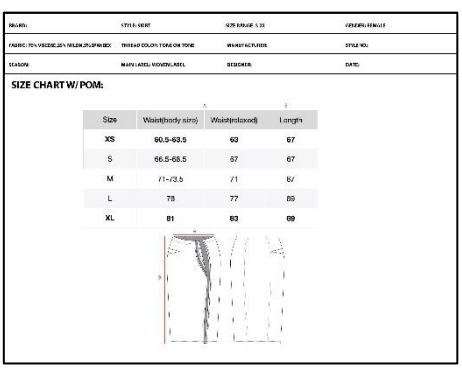
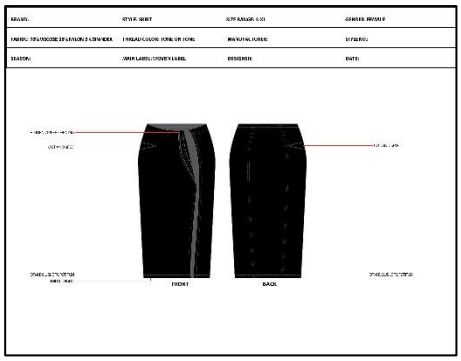
First Model Jacket/Blazer	
This piece, known as a jacket or blazer, is an essential wardrobe item, especially for working individuals. However, this jacket is specifically designed for people with mobility disabilities and wheelchair users, providing comfort and adapting to their needs. • **Front:** The front of this adaptive jacket resembles a traditional blazer with a collar and front panel, which can be either single or double-breasted, depending on the design. • **Back:** The back of the adaptive jacket differs significantly from standard jackets. It is partially open to allow greater comfort for wheelchair users, avoiding friction and discomfort. A zipper runs from the middle back to the neck, making it easy to put on and remove.	**Garment Descriptions:**

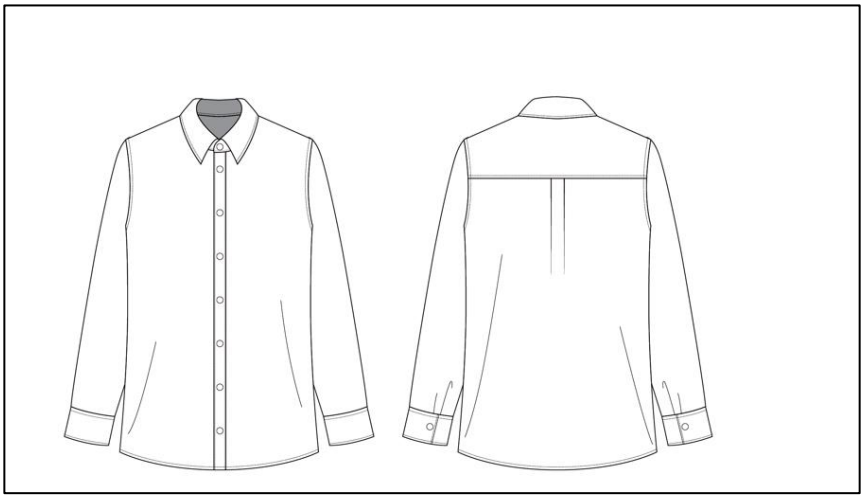
  *Model Image, Flat Design, Pattern, and Production Card below.*	Model Image
	Model surface
	Model pattern

    	Industrial operation card

Second Model: Skirt	
Known as a skirt, this garment is a basic item for women and an essential piece for women with mobility disabilities. It is tailored to meet their needs with an elastic waistband and a zipper positioned either at the front center or the left front side. Various styles and fabrics are available, but the length and width must be carefully considered to avoid impeding movement while using a wheelchair.	Description of the garment piece

 *Model Image, Flat Design, Pattern, and Production Card below.*	Model Image
	Model surface

	Pattern of the model
 BOM:  SIZE CHART W/ POM: Size / Waist(body size) / Waist(relaxed) / Length XS 60.5-63.5 63 67 S 65.5-68.5 67 67 M 71-73.5 71 67 L 76 77 69 XL 81 83 69  FRONT BACK  COLORWAY:  REFERENCE ONLY: 	Industrial operation card

Third Model: Shirt	
Known as a shirt, this piece is a staple for both men and women. It has been specially designed for people with mobility disabilities. The shirt is slightly loose-fitting and includes magnetic buttons, making it easier to put on and take off.	Description of the garment piece
 *Model Image, Flat Design, Pattern, and Production Card below.*	Model Image
	Model surface

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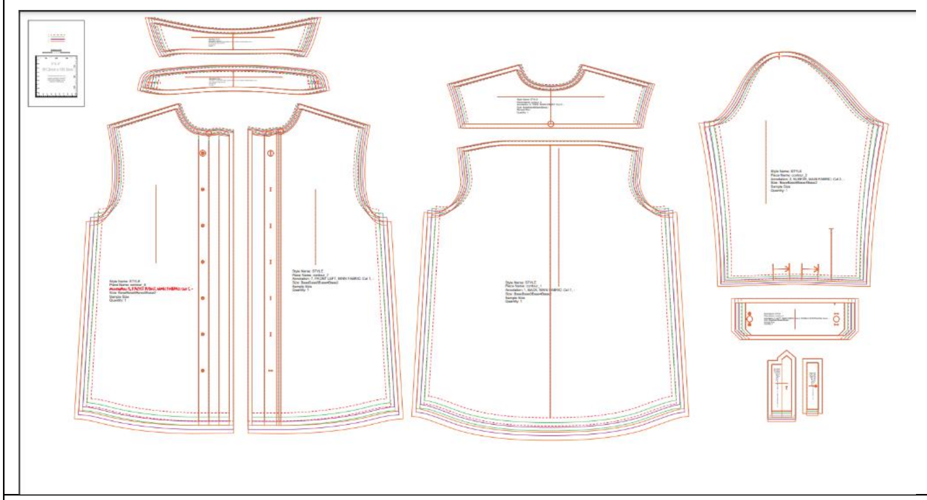
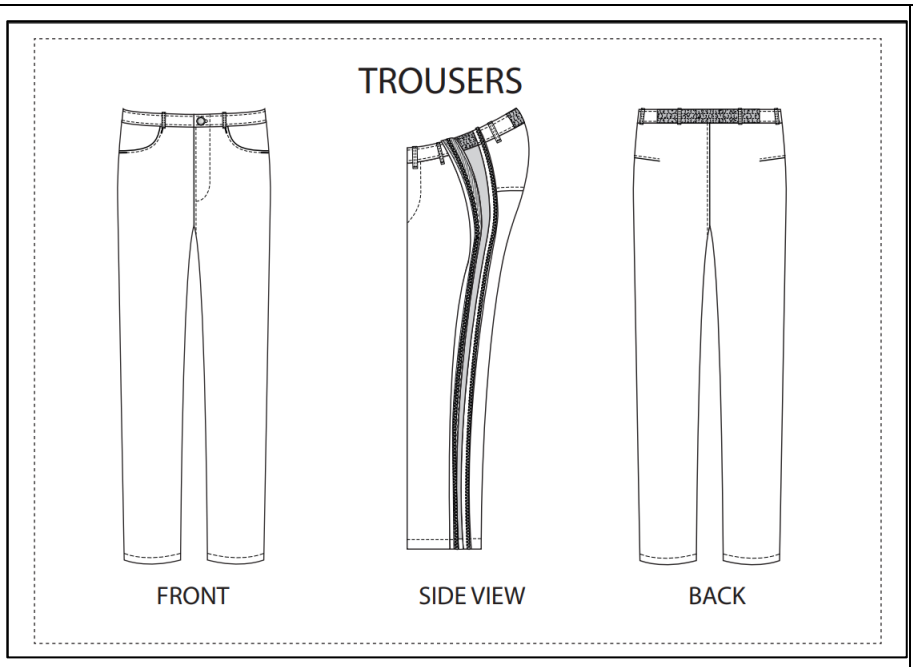
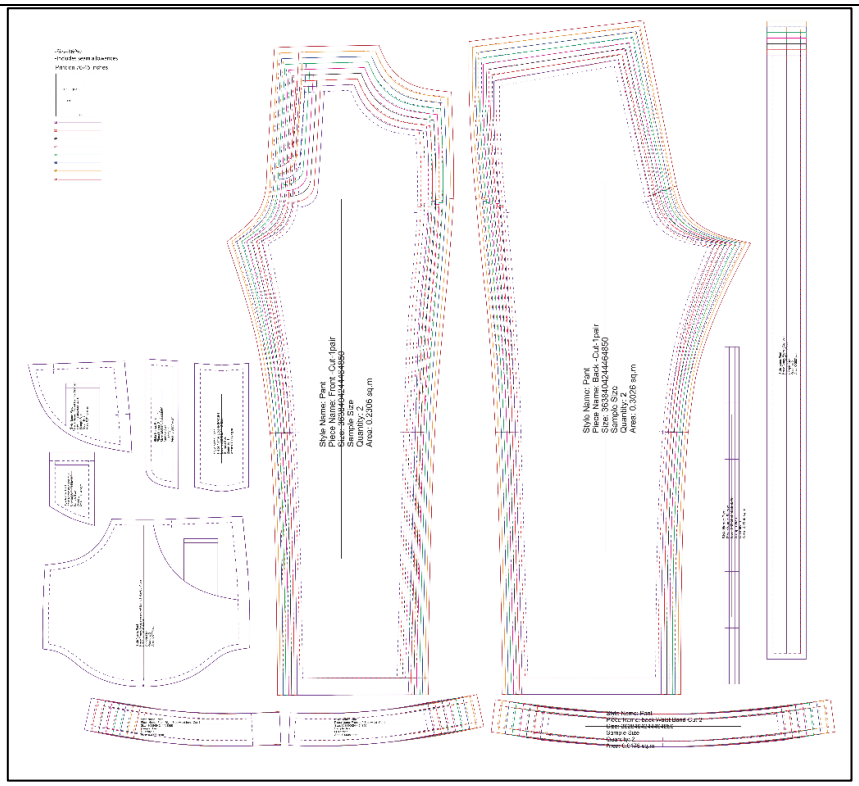
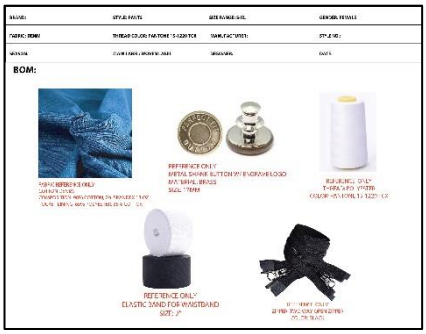
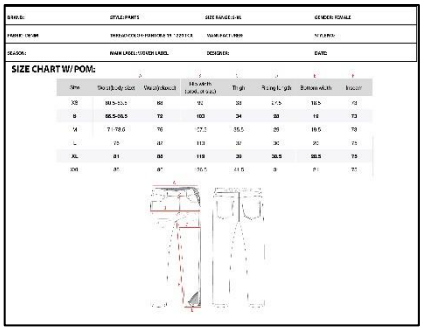
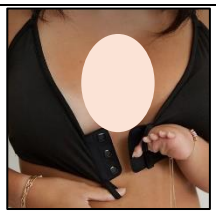
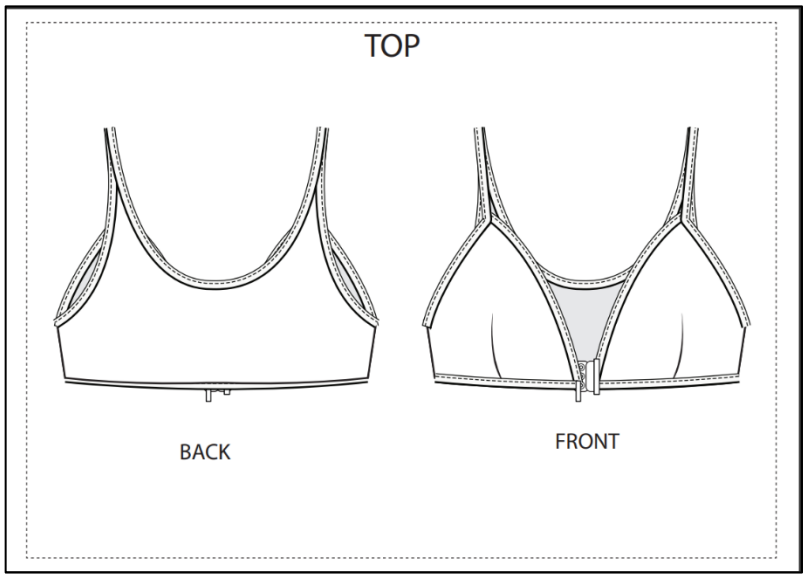
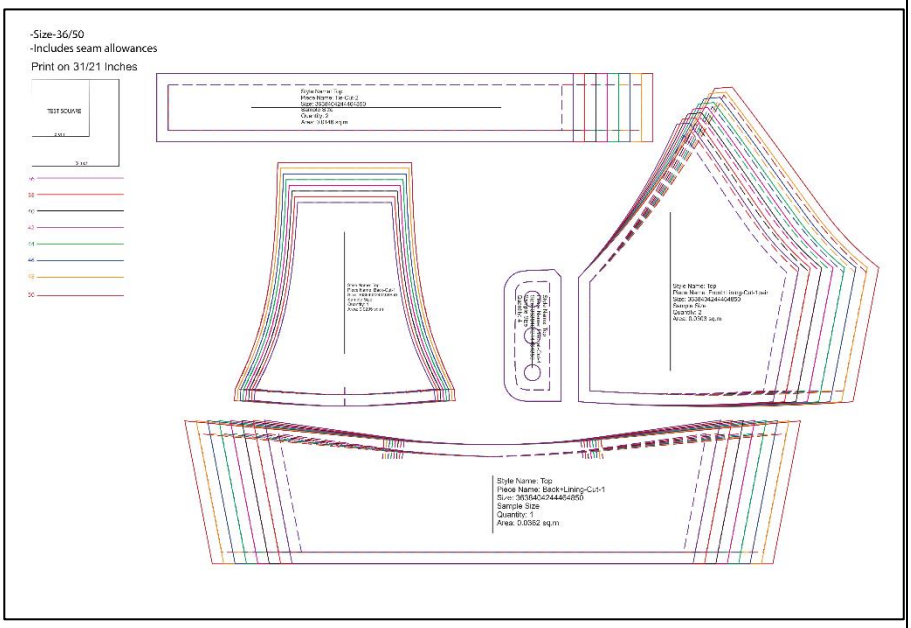
	Model Pattern
	Industrial operation card

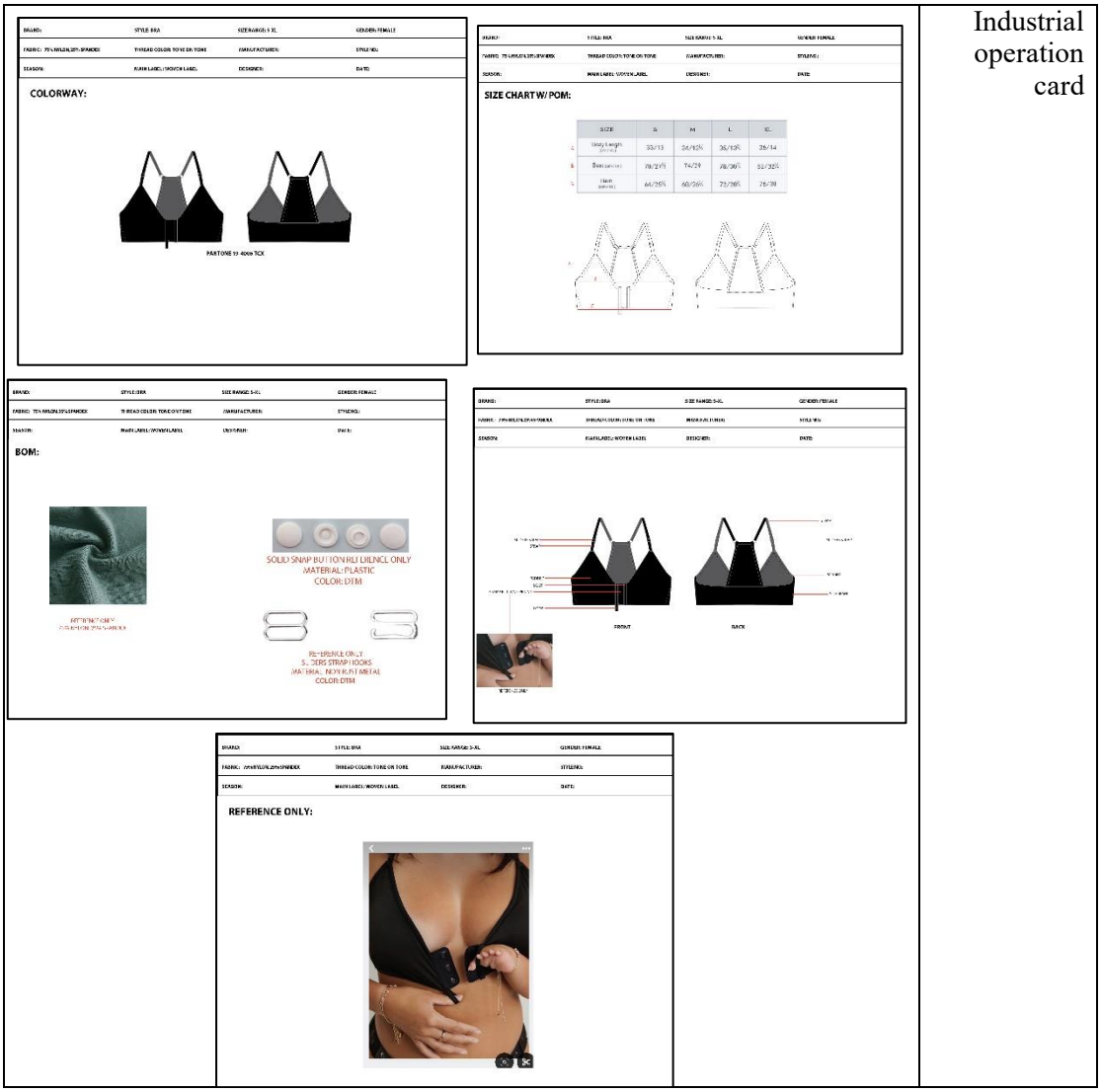
Fourth Model: Pants	
These pants are specifically designed for individuals with lower-limb mobility disabilities and can be worn by both men and women. They are long pants (with the length not extending beyond the ankle), featuring zippers on the outer seams of both legs. The back includes a fabric panel (usually made from slightly stretchy material) that provides comfort while wearing and helps prevent the pants from slipping down.	Description of the garment piece
 *Model Image, Flat Design, Pattern, and Production Card below.*	Model Image

	Model surface
	Model Pattern

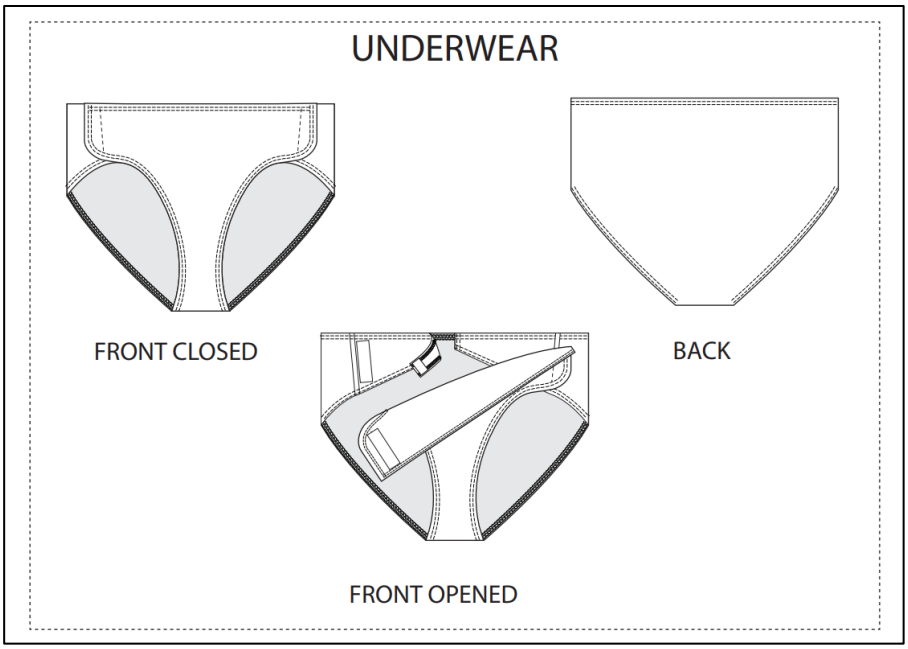
    	Industrial operation card

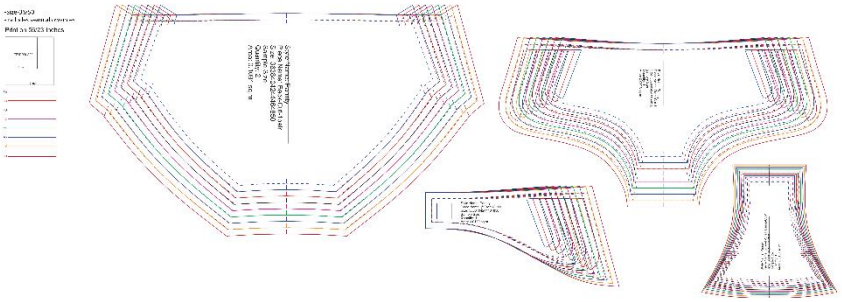
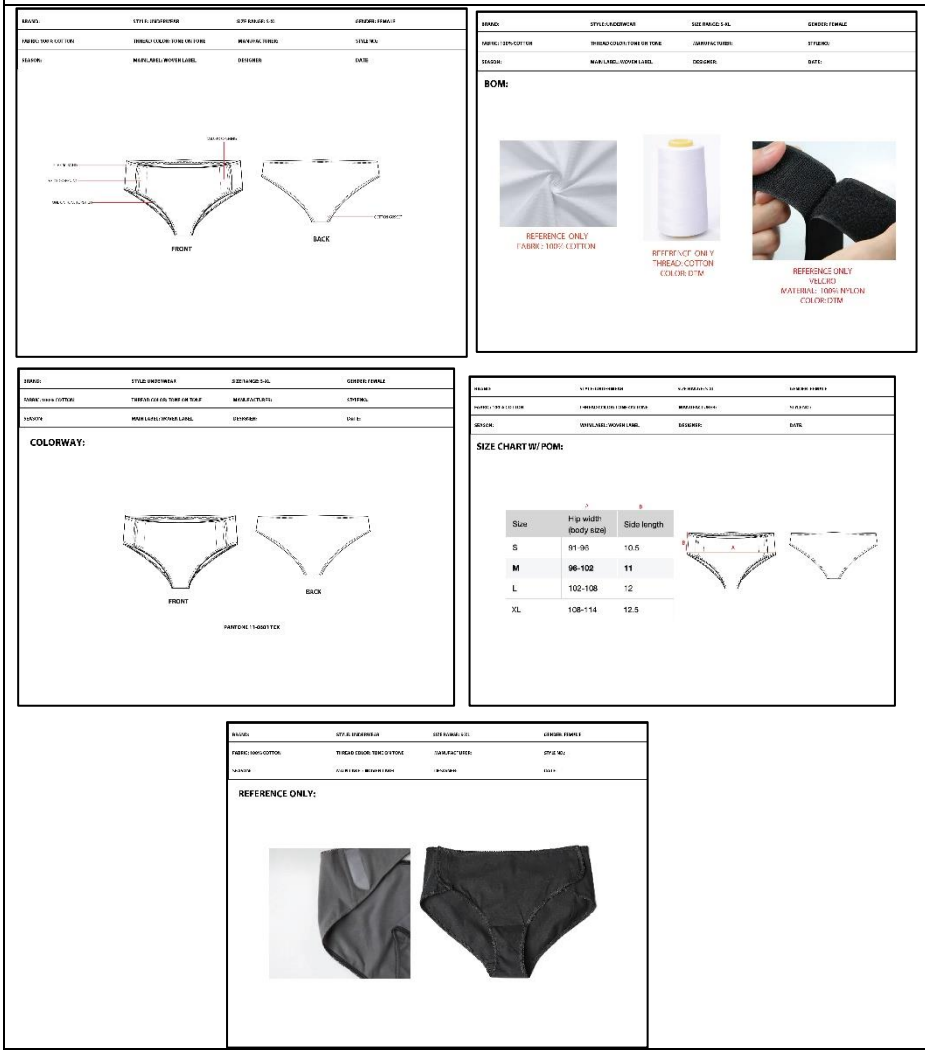
Fifth Model: Bra (Undergarment)	
Known as a bra, this undergarment is essential for women, particularly those with mobility disabilities. This specially designed bra features soft fabric without excessive support or plastic underwire, along with a front closure to facilitate easy dressing and undressing.	Description of the garment piece
 *Model Image, Flat Design, Pattern, and Production Card below.*	Model Image

	Model surface
	Pattern of the model

	Industrial operation card

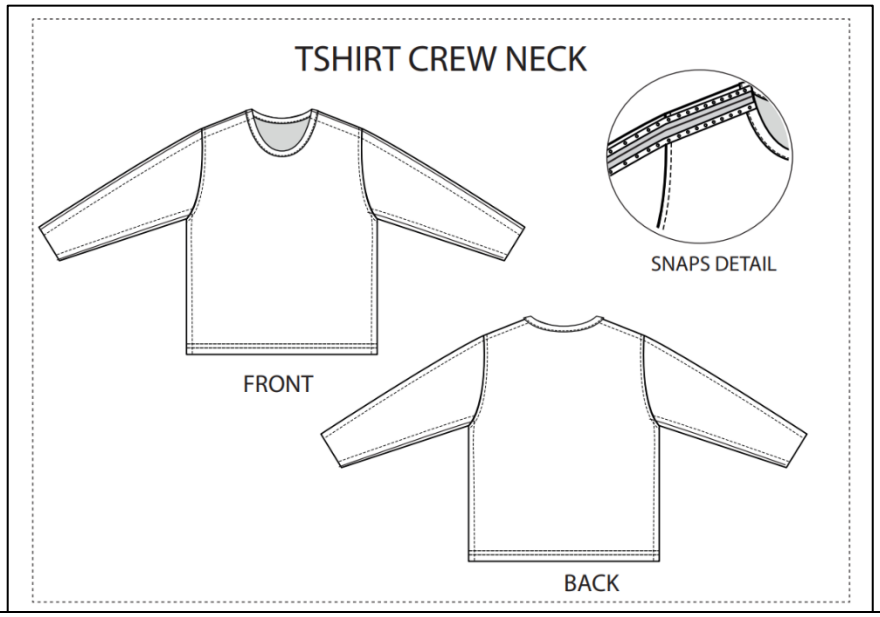
Sixth Model: (Underwear - "Underpants")	
Known as underwear, this garment is suitable for women, men, and children alike. Therefore, it is important to have a design that accommodates those with mobility disabilities. This adaptive design includes a front closure using a Velcro strip, making it easier to put on and take off.	**Garment Descriptions:**

 *Model Image, Flat Design, Pattern, and Production Card below.*	Model Image
	Model

	Pattern of the model
	Industrial operation card

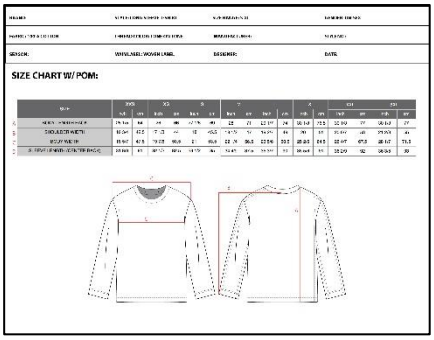
Seventh Model 7 (T-shirt)
This garment, known as a T-shirt, is a wardrobe staple for everyone. Made from cotton, it is worn as an upper-body garment. T-shirts come in various styles, types, sizes, and fabrics. The pattern for this T-shirt includes short sleeves with a body-conforming fit. It can be easily worn and removed with

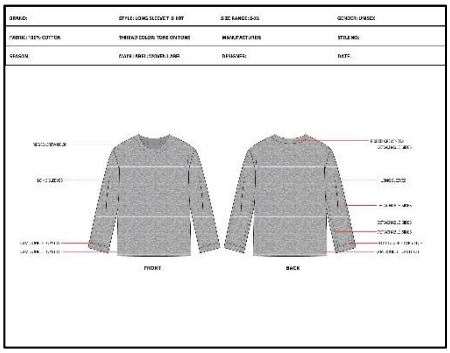
Description of the garment piece

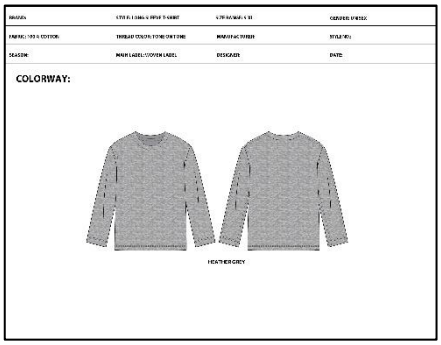
magnetic buttons or a Velcro strip running from the shoulder down to the hem, facilitating dressing and undressing.	
 *Model Image, Flat Design, Pattern, and Production Card below.*	Model Image
	Model surface

Pattern of the model

Industrial operation card

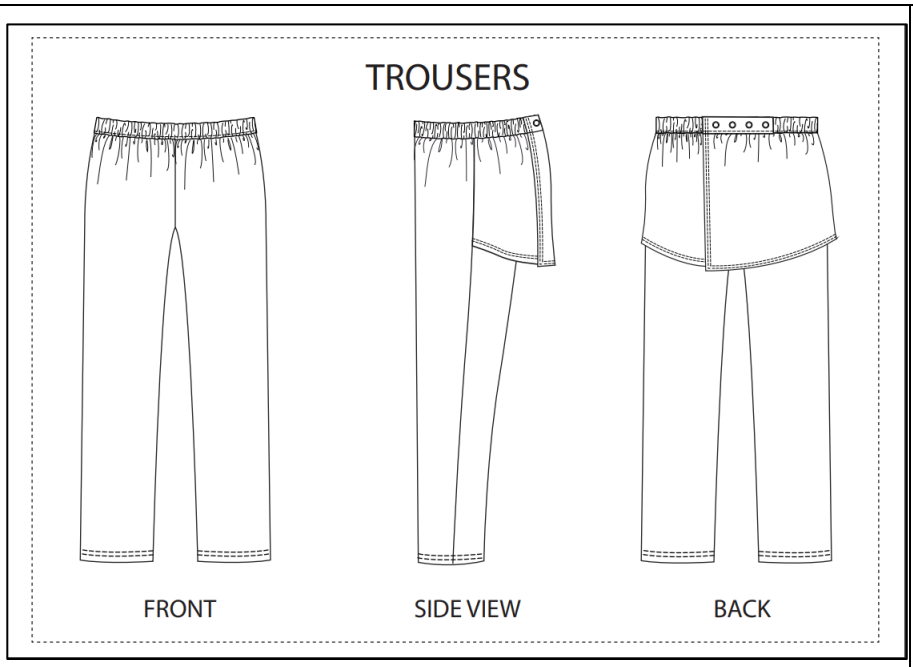


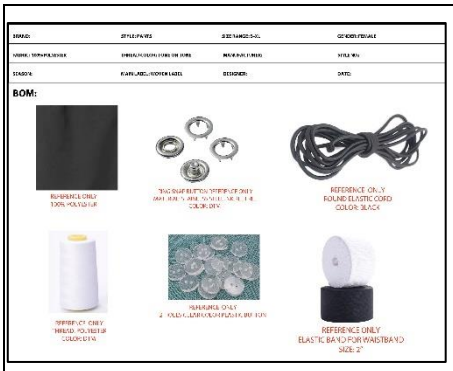


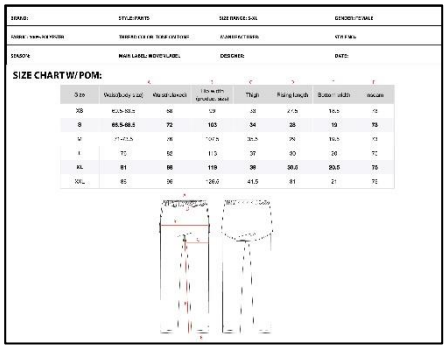


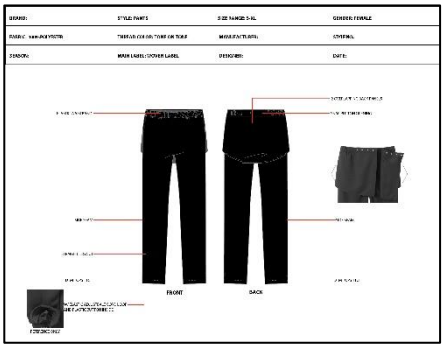
Eight Model

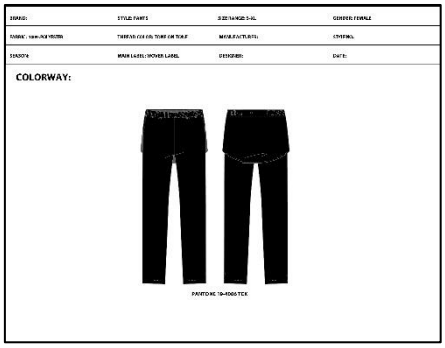
(Pants 2) (The Executed Model)	
Known as pants or sports pants, this garment can be worn by all people with disabilities, including those with lower-limb mobility impairments. These sports pants are made of slightly stretchy fabric, featuring a back closure and an elastic waistband, allowing for easy dressing and undressing.	Description of the garment piece
 *Model Image, Flat Design, Pattern, Production Card, Pattern Printing, Pattern Placement on Fabric, Fabric Cutting, and Final Sewn Garment below.*	Model Image

	Model Surface
	Pattern of the model

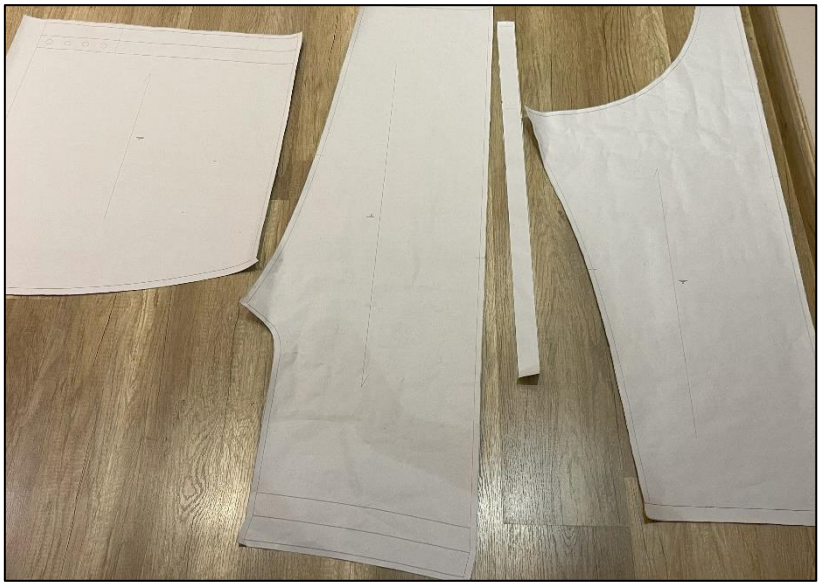








Description of the garment piece



Pattern Printing

 	Placing the Pattern on Fabric
	**Cutting the Fabric:**

	**The Piece After Sewing Process:**

Study Results

After collecting the data and inputting it into the SPSS statistical analysis program, data processing and analysis were conducted to study the impact of using artificial intelligence applications in design. The results of the study are as follows:

Model 1 (Jacket):

Questions	Yes	Maybe	No
Suitable for individuals with lower limb mobility impairments	8(61.5%)	5(38.5%)	0(0%)
Easy to wear and remove	11(84.6%)	2(15.4%)	0(0%)
Easy to understand and use the pattern	10(76.9%)	3(23.1%)	0(0%)
Recommended for marketing	11(84.6%)	2(15.4%)	0(0%)
Provides flexibility	11(84.6%)	2(15.4%)	0(0%)
Allows for the creation of multiple models	10(76.9%)	3(23.1%)	0(0%)
Satisfaction with the overall pattern design	12(92.3%)	1(7.7%)	0(0%)

The jacket model received high positive ratings in most of the questions, with a note on improved understanding of the pattern and the possibility of creating multiple models.

Model Two (Skirt):

Questions	Yes	Maybe	No
Suitable for individuals with lower limb mobility impairments	12(92.3%)	1(7.7%)	0(0%)
Easy to wear and remove	11(84.6%)	2(15.4%)	0(0%)
Easy to understand and use the pattern	11(84.6%)	2(15.4%)	0(0%)
Recommended for marketing	12(92.3%)	1(7.7%)	0(0%)
Provides flexibility	12(92.3%)	1(7.7%)	0(0%)
Allows for the creation of multiple models	12(92.3%)	1(7.7%)	0(0%)
Satisfaction with the overall pattern design	11(84.6%)	2(15.4%)	0(0%)

The skirt model received extremely positive ratings, with overall high satisfaction. It is recommended to continue marketing it with the same quality.

Model Three (Shirt):

Questions	Yes	Maybe	No
Suitable for individuals with lower limb mobility impairments	10(76.9%)	3(23.1%)	0(0%)
Easy to wear and remove	9(69.2%)	4(30.8%)	0(0%)
Easy to understand and use the pattern	11(84.6%)	2(15.4%)	0(0%)
Recommended for marketing	11(84.6%)	2(15.4%)	0(0%)
Provides flexibility	9(69.2%)	4(30.8%)	0(0%)
Allows for the creation of multiple models	9(69.2%)	4(30.8%)	0(0%)
Satisfaction with the overall pattern design	9(69.2%)	4(30.8%)	0(0%)

The shirt model needs improvements in ease of wearing and removal, as well as providing more flexibility in the design.

Model 4 (Pants 1):

Questions	Yes	Maybe	No
Suitable for individuals with lower limb mobility impairments	12(92.3%)	1(7.7%)	0(0%)
Easy to wear and remove	10(76.9%)	3(23.1%)	0(0%)
Easy to understand and use the pattern	11(84.6%)	2(15.4%)	0(0%)
Recommended for marketing	9(69.2%)	4(30.8%)	0(0%)
Provides flexibility	9(69.2%)	4(30.8%)	0(0%)
Allows for the creation of multiple models	8(61.5%)	5(38.5%)	0(0%)
Satisfaction with the overall pattern design	9(69.2%)	4(30.8%)	0(0%)

The pants model is good, but there is a need to improve the ease of wearing and removal and provide more flexibility.

Model 5 (Bra):

Questions	Yes	Maybe	No
Suitable for individuals with lower limb mobility impairments	12(92.3%)	1(7.7%)	0(0%)
Easy to wear and remove	12(92.3%)	1(7.7%)	0(0%)
Easy to understand and use the pattern	11(84.6%)	2(15.4%)	0(0%)
Recommended for marketing	11(84.6%)	2(15.4%)	0(0%)
Provides flexibility	11(84.6%)	2(15.4%)	0(0%)
Allows for the creation of multiple models	12(92.3%)	1(7.7%)	0(0%)
Satisfaction with the overall pattern design	12(92.3%)	1(7.7%)	0(0%)

The bra model received high positive ratings across all questions, indicating that the design successfully meets the needs of individuals with mobility disabilities.

Model 7 (Underwear):

The underwear model received positive ratings in most categories. Marketing recommendations and implementation can be improved to ensure overall satisfaction.

Questions	Yes	Maybe	No

Suitable for individuals with lower limb mobility impairments	12(92.3%)	1(7.7%)	0(0%)
Easy to wear and remove	12(92.3%)	1(7.7%)	0(0%)
Easy to understand and use the pattern	11(84.6%)	2(15.4%)	0(0%)
Recommended for marketing	10(76.9%)	3(23.1%)	0(0%)
Provides flexibility	12(92.3%)	1(7.7%)	0(0%)
Allows for the creation of multiple models	11(84.6%)	2(15.4%)	0(0%)
Satisfaction with the overall pattern design	12(92.3%)	1(7.7%)	0(0%)

The underwear model received positive ratings in most categories. Marketing recommendations and implementation can be improved to ensure overall satisfaction.

Model 8 (T-shirt):

Questions	Yes	Maybe	No
Suitable for individuals with lower limb mobility impairments	11(84.6%)	2(15.4%)	0(0%)
Easy to wear and remove	11(84.6%)	2(15.4%)	0(0%)
Easy to understand and use the pattern	12(92.3%)	1(7.7%)	0(0%)
Recommended for marketing	10(76.9%)	3(23.1%)	0(0%)
Provides flexibility	10(76.9%)	3(23.1%)	0(0%)
Allows for the creation of multiple models	11(84.6%)	2(15.4%)	0(0%)
Satisfaction with the overall pattern design	11(84.6%)	2(15.4%)	0(0%)

The T-shirt model received positive ratings in most categories. Marketing recommendations and implementation should be improved, and sufficient flexibility should be ensured to increase user satisfaction.

Model 9 (Pants 2):

Questions	Yes	Maybe	No
Suitable for individuals with lower limb mobility impairments	11(84.6%)	2(15.4%)	0(0%)
Easy to wear and remove	11(84.6%)	2(15.4%)	0(0%)
Easy to understand and use the pattern	10(76.9%)	3(23.1%)	0(0%)
Recommended for marketing	12(92.3%)	1(7.7%)	0(0%)
Provides flexibility	11(84.6%)	2(15.4%)	0(0%)
Allows for the creation of multiple models	12(92.3%)	1(7.7%)	0(0%)
Satisfaction with the overall pattern design	12(92.3%)	1(7.7%)	0(0%)

The pants model is good, but there is a need to improve the ease of wearing and removing it, as well as to provide greater flexibility.

Conclusion:

Based on the study results, it can be concluded that the patterns designed for individuals with lower-limb mobility impairments have a noticeable impact on fashion design, especially in improving quality of life and producing industrial patterns that meet consumer needs. The study revealed a good acceptance of the designs, with some variation in opinions reflecting individual preferences. The results indicate a growing demand for designs that meet the needs of all social groups, where fashion design contributes to community service and improves quality of life.

Recommendations:

1. **Increase Awareness:** Promote awareness of the importance of designs tailored for individuals with lower-limb mobility impairments through promotional campaigns and awareness workshops.
2. **Ongoing Research and Development:** Continue researching and developing designs, and create models based on basic patterns to ensure continuous improvement.
3. **Develop Marketing Strategies:** Marketing strategies should be developed to produce these designs on a larger scale to ensure they reach the target audience.
4. **Improve Designs:** Focus on improving designs to achieve the goal of ease of wearing, removing, and flexibility.
5. **Education and Learning:** These patterns should be taught as part of the curriculum in the Clothing Manufacturing Department, as elective courses, to enhance the educational environment's effectiveness.

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