



ENHANCING INDEPENDENCE: A STUDY ON INNOVATIVE ADAPTIVE CLOTHING FOR DISABILITIES

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Abstract: *The global issue of improving the quality of life for individuals with special needs calls for the fashion industry's dedication to offering equal opportunities, preventing discrimination, and raising their living standards as active members of society. The field of adaptive clothing has evolved over the years, showcasing a big progress from the early 20th century's practical solutions to the innovative technology of today. Adaptive clothing is designed to assist people with various physical limitations by incorporating features that make dressing and undressing easier, often without requiring assistance. This research delves into the critical need to enhance the quality of life for individuals with disabilities, particularly through the development of adaptive clothing tailored to the needs of wheelchair users. By thoroughly examining disability classifications and clothing requirements, it underscores the importance of tailored solutions to address comfort and functionality challenges. The study emphasizes the pivotal role of adaptive clothing in fostering independence and reducing reliance on assistance for those with physical disabilities. Through a focused case study, a garment specifically designed for wheelchair users is developed, featuring innovative design modifications aimed at optimizing both comfort and functionality. With a strong emphasis on functionality and comfort, the research prioritizes meeting both consumer preferences and physiological needs. Ultimately, the goal of this research is to raise the standard of adaptive clothing, promoting inclusivity and enhancing the overall well-being of individuals with disabilities.*

Key words: *Adaptive clothing, Disabilities, Quality of life, Inclusivity functionality, innovation.*

1. INTRODUCTION

The quest to improve the quality of life for people with disabilities has long been a significant concern, prompting innovative solutions to address their diverse needs. In contemporary society, people with disabilities represent the largest minority cohort worldwide, yet remain quite underserved and inadequately represented. Today's problem of the fashion industry is the failure to prioritize accessibility in design. As a result, this communicates to a significant portion of the population, approximately one in every four individuals, that their inclusion and participation are not valued or desired. [1,8]

Adaptive clothing, particularly tailored for wheelchair users, emerges as a vital aspect of this endeavor. The development of such clothes represents a crucial step in promoting independence and autonomy among individuals with disabilities, lessening their reliance on external assistance for



daily tasks. By focusing on functionality, comfort, and inclusivity, this research seeks to elevate the standard of adaptive clothing.

Through collaborative efforts and a commitment to inclusivity, the fashion industry can play a pivotal role in fostering a more accessible and equitable society for all. [1,8]

2. GENERAL INFORMATION

The term disability is defined as any type of limitation or inability to perform a certain activity that falls within an interval considered "normal" for a person. It is also characterised by deficiencies or excesses in activities or behaviours normally expected of a person. The disability can be temporary or permanent, reversible or irreversible, progressive or regressive. [5,10].

Improving the quality of life is an issue of national and international concern. It is a responsibility for us, people from the fashion industry to create equal opportunities for persons with disabilities, to prevent any intentional or unintentional discrimination they face and to improve their standard of living and ensure that they have an equal share in social development as productive members of society [4,10,11].

The majority of adaptive clothing currently available in the market is primarily designed to aid caregivers in reducing physical strain while dressing individuals with disabilities. It has been observed that individuals with physical disabilities encounter challenges in finding clothing that not only fits well but also aligns with their personal style. This issue stems from several factors: [6,9]

1. Most garments are tailored for individuals in a standing position, which does not cater adequately to the needs of individuals with disabilities.
2. A significant portion of individuals with disabilities does not conform to the standard size categories, indicating a misalignment between their body dimensions and the current sizing system.

According to the data sourced from [2], it is projected that approximately 5% of Romania's population, equivalent to nearly 900,000 individuals, possesses a disability certificate as of June 2023. Remarkably, women exhibit a higher prevalence among individuals with disabilities in Romania.

In a broader European context, based on *Fig 1*, as of 2022, Eurostat estimates indicate that 27% of the European Union population aged 16 and above reported having some form of disability. This corresponds to approximately 101 million people, constituting one in every four adults in the EU. [3]

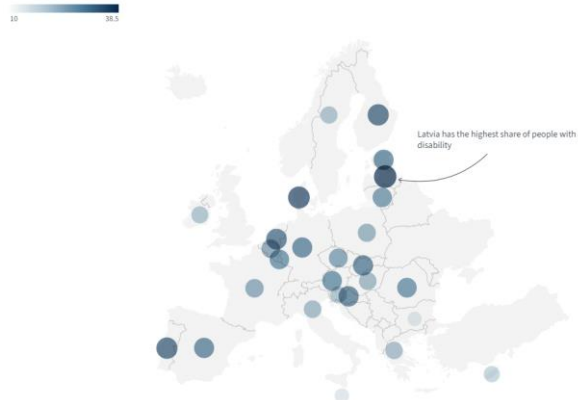


Fig. 1: The map of percentage of people with a disability by country in EU for 2022 [3]

In 2022, across all member states of the EU, the proportion of women with disabilities exceeded that of men. As shown in *Fig. 2*, on average, 29.5% of the total female population in the EU was reported to have a disability, in contrast to 24.4% of the total male population. [3]

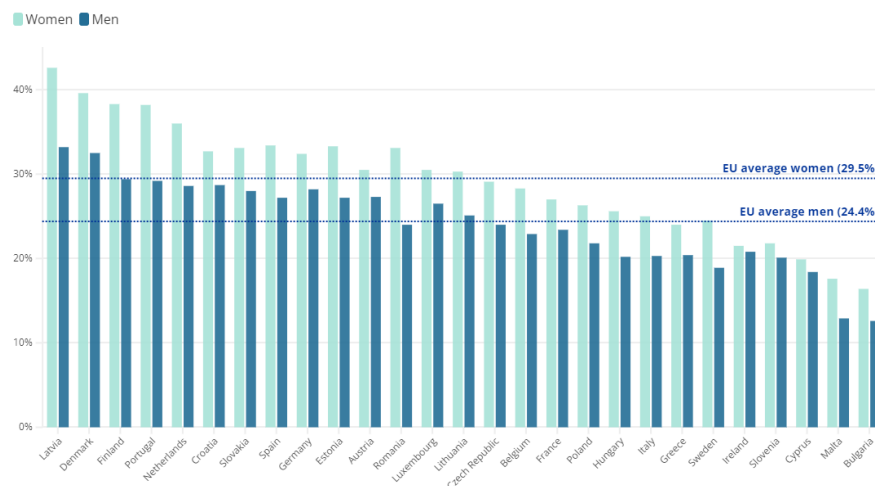


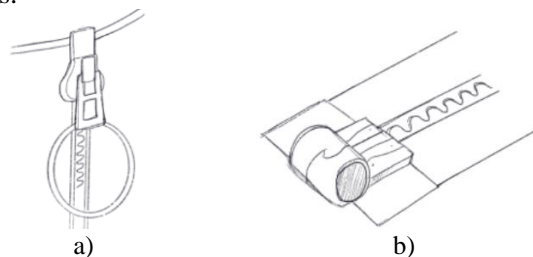
Fig. 2: The proportion of people with a disability by country in EU for 2022 [3]

3. PRACTICAL ASPECTS

3.1. Recommendations

Various disabilities, including cerebral palsy, arthritis, muscular dystrophy, multiple sclerosis, and paralysis, manifest in diverse ways, impacting movement, muscle control, and posture. Individuals affected by these conditions often experience difficulties such as stiff muscles, heightened reflexes, impaired balance, and involuntary movements. These physical challenges can progressively affect fine motor skills, particularly in the wrists, hands, fingers, feet, and toes, making tasks like manipulating zippers or buttons challenging. [6,10,11]

Drawing from this understanding, this research endeavors to explore the intricacies of adaptive clothing design, particularly focusing on addressing the complex needs of individuals reliant on wheelchairs. By examining specific clothing requirements for those leading sedentary lifestyles due to wheelchair use, the study aims to propose innovative solutions that enhance comfort, functionality, and overall quality of life. *Fig. 3* illustrates one such solution, demonstrating how attaching a ring to the zipper slider and utilizing magnetic closure can significantly ease the dressing and undressing process.



*Fig. 3: Recommendation for details of adaptive clothes: [7]
a) ring attached to a zipper slider; b) magnetic zipper;*

In line with this objective, the research proposes to adapt a vest using CLO3D software for simulating and fitting virtual garments. This approach allows for a systematic exploration of garment design adjustments tailored to the unique needs of wheelchair users, paving the way for improved accessibility and inclusivity in clothing design.

3.2. Case Study

In the proposed case study, the individual demonstrates functionality in the upper body, including functional upper limbs with slight tremors and weakness in the hands, while experiencing impairment in the lower limbs. Additionally, a third-party helper is present.

Given these circumstances, our proposal revolves around designing a sleeveless vest, *Fig. 4*, meticulously tailored to meet the specific needs of this individual. The vest design incorporates several key features to enhance usability and comfort. A full-front zipper with a magnetic closure at one end, coupled with a slider attached to a textile ring, facilitates easier manipulation, especially for individuals with hand weakness or tremors. The collar, designed with short, rounded corners, prioritizes comfort during wear.

Furthermore, the back part of the vest is divided into three sections, incorporating Velcro bands to streamline the dressing and undressing process, thereby ensuring accessibility and convenience for both the wearer and the assisting caregiver.

An additional functional and design element is the inclusion of side slits, offering flexibility and comfort in case of weight fluctuations due to medical treatments, as well as catering to individuals whose disabilities may not be visually apparent but still benefit from adapted clothing.

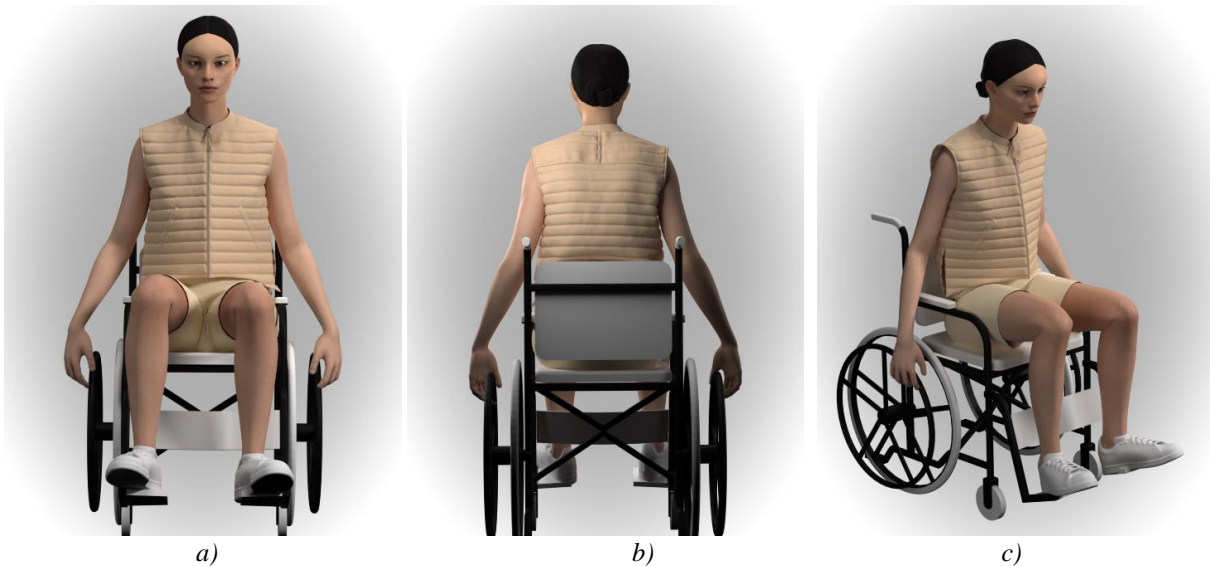


Fig. 4: The sleeveless vest view from the: a) front; b) back; c) side.

The vest (*Fig. 5*) is crafted in a neutral, warm beige color to promote psychological comfort for the wearer and maximize its versatility. Moreover, angled pockets are strategically positioned to offer both comfort and functionality, catering to the wearer's needs and preferences. This thoughtful design approach aims to optimize functionality and comfort while addressing the unique challenges presented by the individual's condition.



Fig. 5: The sleeveless vest details: a) pockets; b) zipper and slider; c) back; d) split.

5. CONCLUSIONS

The prevalence of disabilities underscores the urgency for inclusive solutions in fashion design. By prioritizing accessibility and addressing the diverse needs of individuals with disabilities, adaptive clothing represents a vital step towards fostering inclusivity and enhancing quality of life.

Through meticulous design considerations and innovative features such as magnetic closures, adjustable collars, and segmented back sections, tailored solutions can effectively cater to the unique challenges faced by individuals reliant on wheelchairs. The proposed vest design, featuring side slits and angled pockets, exemplifies a holistic approach to adaptive clothing, balancing functionality with comfort and aesthetics.

Moving forward, continued research and collaboration within the fashion industry are essential to ensure that adaptive clothing remains responsive to the evolving needs of individuals with disabilities, thereby promoting dignity, independence, and social inclusion.



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