

TOUCH FREE CLOTHING

Final Project 2025 – 2026

By Wendosen Seife Haile

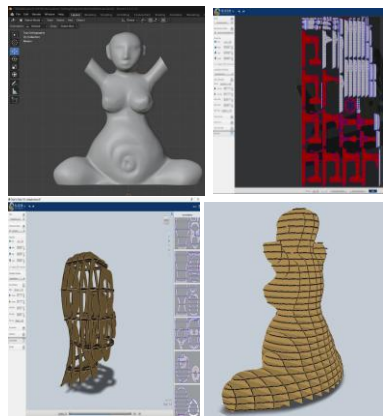


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textile and technology academy

At Fabricademy



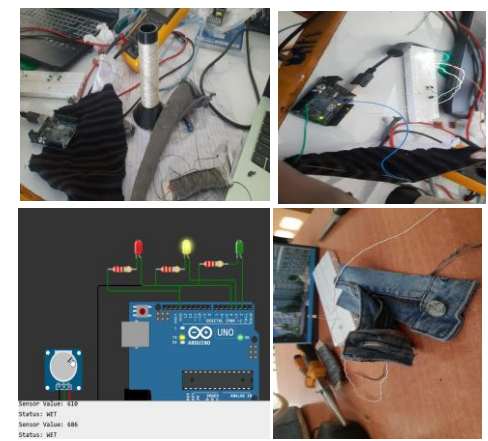
Digital Bodies



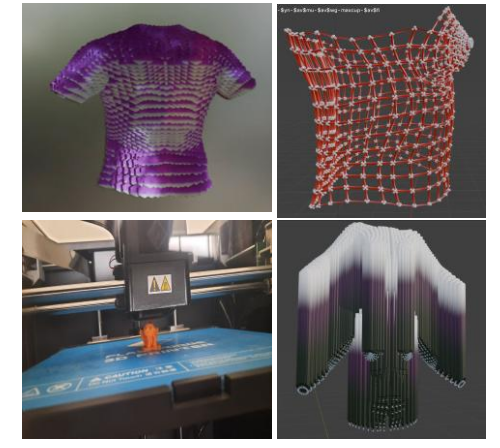
Circular Open Source Fashion



Biochromes



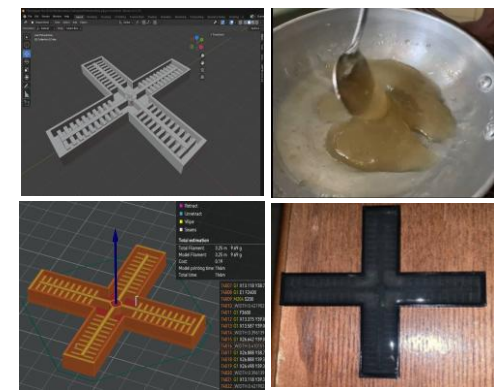
E-textiles



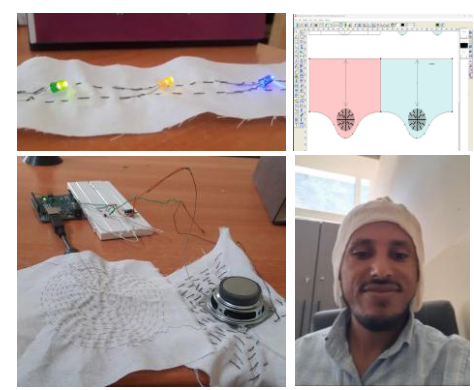
Computational Couture



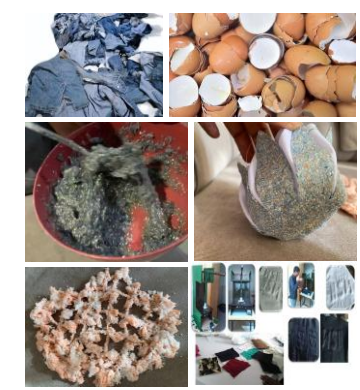
BioFabricating Materials



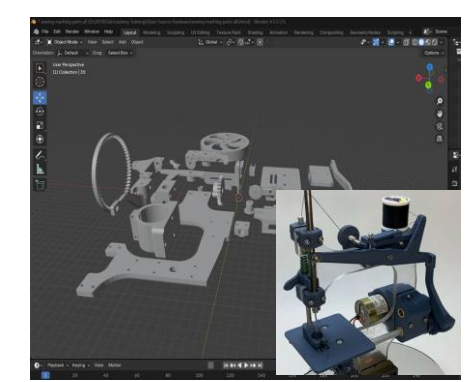
Soft Robotics



Wearables



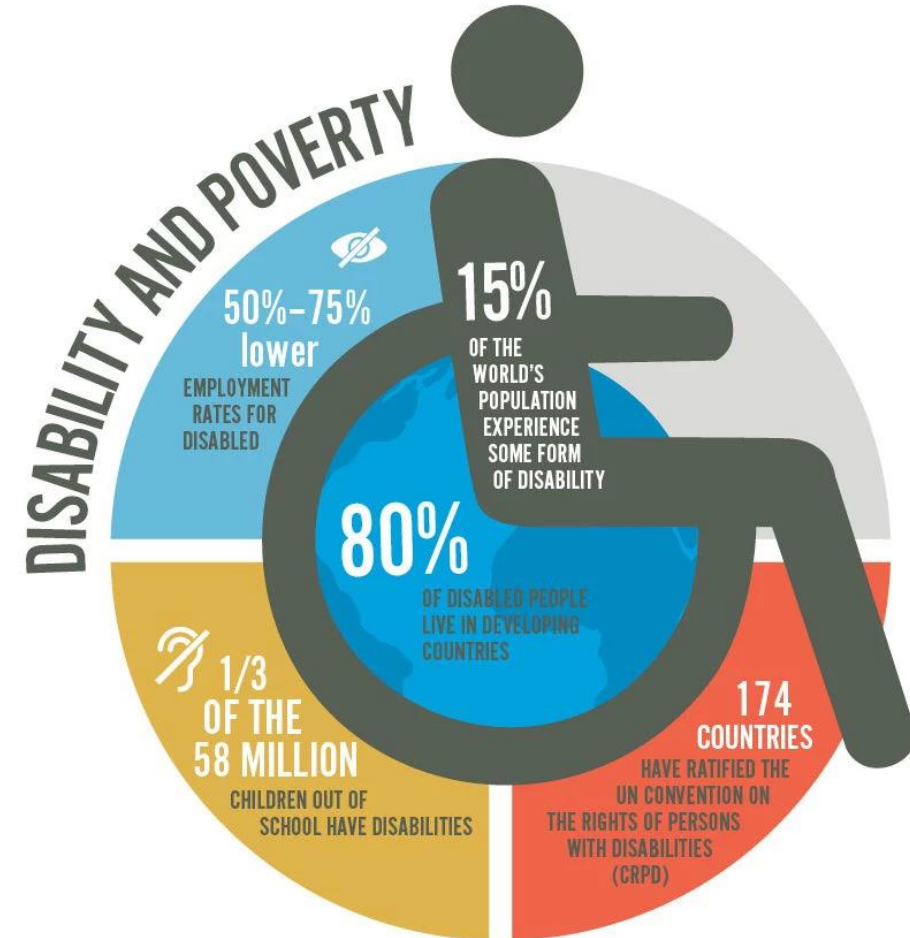
Textile Scaffold



Open-Source Hardware

Rationale

- According to the World Health Organization, **1.3 billion people** live with **significant disabilities** (Bukhantsova et al., 2024).
- Based on the Policy Studies Institute and UNICEF in **2025 National Survey - 19.7% of the population (120m) live with Disabilities in Ethiopia.** (<https://psi.org.et/index.php/blog>).
- Therefore, **Assistive clothing** blends style and function to promote independent dressing for disables.



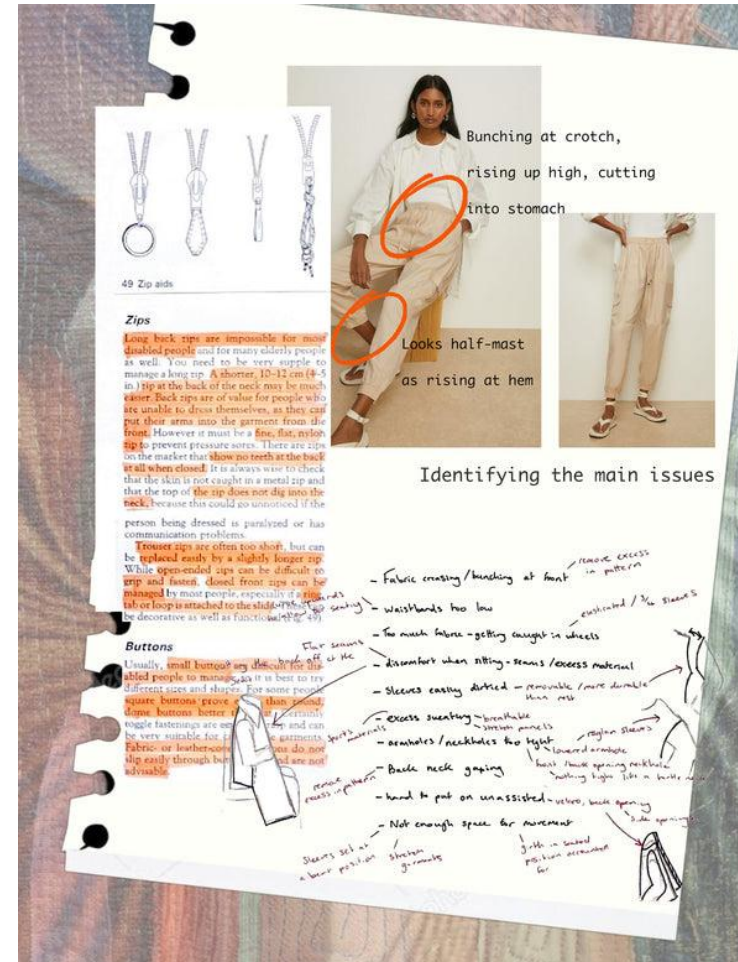
<https://blogs.worldbank.org/>

The Evolution of Adaptive Fashion

- The Early Years: Functional Necessity Inspires Design
- World War II: Catalyst for Change
- The Emergence of the Term Adaptive Fashion
- The Rise of Specialized Brands: The 80's
- Technology Meets Fashion: 21st Century



Functional jeans for handicap (Levi's Letter June, 1975)



State of the Art

- Adaptive fashion line with zipper, magnetic closures and easy dressing systems.



(Ayachit, S. and Thakur, M., 2017)

Research Question?

- How can I make **physically disabled people inclusive in fashion technology?**
- How can **clothing be designed to simplify the lives of people with physical disabilities?**



Ideation & Sketch

- Although extensive research exists on **adaptive shirts**, **soft robotic gloves**, and **inflatable textile actuators**, none of these works address the unique challenges of **developing touch free pants for lower body dressing**.
- By exploring how **soft robotic** and **textile-based actuators** can assist with **autonomous pants wearing** and **donning**, this study introduces an unexamined application area and therefore contributes novel insights to adaptive clothing research.

([Yap et al., 2017](#); [McLeod et al., 2020](#); [Goshtasbi et al., 2025](#))

Ideation & Sketch

- Finally, the project touches well with **technological innovation, engineering for societal benefit, disability inclusion, and community centered research.**
- Developing touch free pants integrates advanced engineering with social impact, **addressing real world problems** experienced by vulnerable populations.

Reference Projects

- Pola Demianiuk creates robotic clothing that **assists the body to be dressed** (<https://youtu.be/c2xEddUybDg>)



Integration of Soft Robotics

- Tommy Adaptive (Tommy Hilfiger): adaptive fashion line with magnetic closures and easy dressing systems (<https://www.myseismic.com/>)

**Inclusive Design
Innovative Fastening Systems**



- Silvert's Adaptive Clothing & Footwear for Women and Men (<https://www.youtube.com/watch?v=eK9B0D1m6IM>)

**Make practical ease of Dressing and
Footwear Innovations with Velcro**



Reference Projects

Wearable Airbags: A Game-Changer in Elderly Fall Prevention by Suzhou Yidaibao Intelligent Technology Co.



<http://www.zgznhh.com/en/>

Preventive Healthcare Approach

<https://www.cacareassociation.org>



Seismic debuts robotic-assistive Powered Clothing undergarments (<https://www.myseismic.com/>)

Support core muscle groups, enhancing strength and endurance during movement

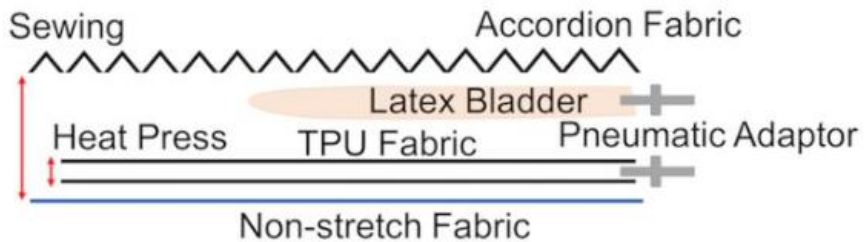
Reference Projects

- Intotum fashion brand is also uses ethical production and sustainable materials for Adaptive and Inclusive Design. (<https://intotumfashion.com/>)



Reference project for prototype

Textile Actuation



Accordion Fabric



Non-stretch Fabric



Latex Bladder



Bonded TPU Fabrics



Integrated Actuator



Bending



Straightening



Twisting

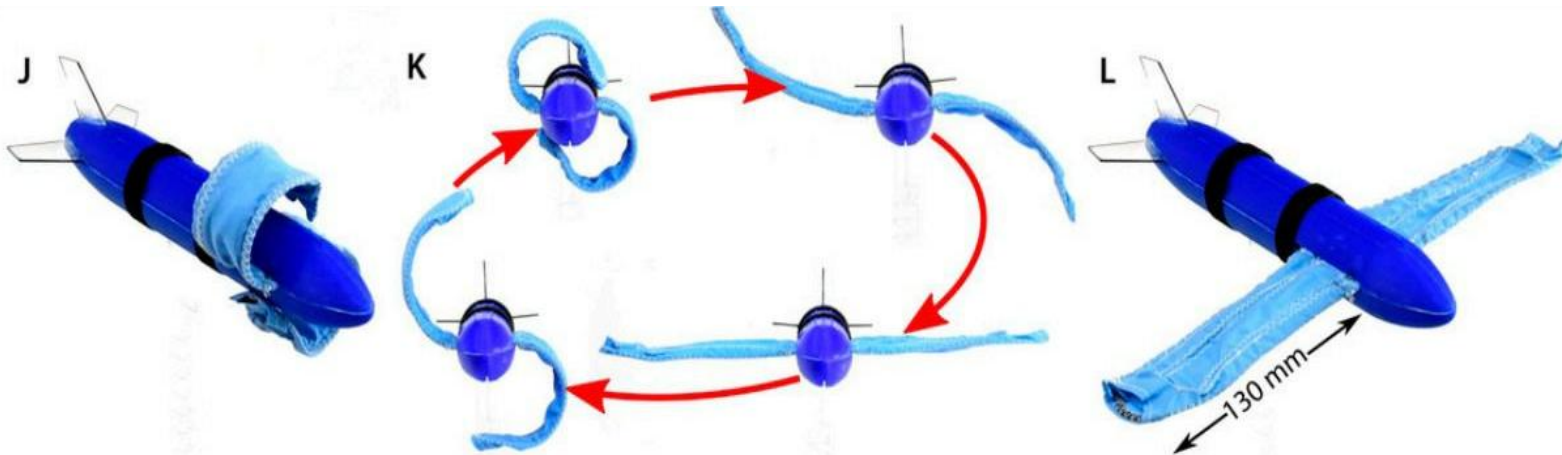
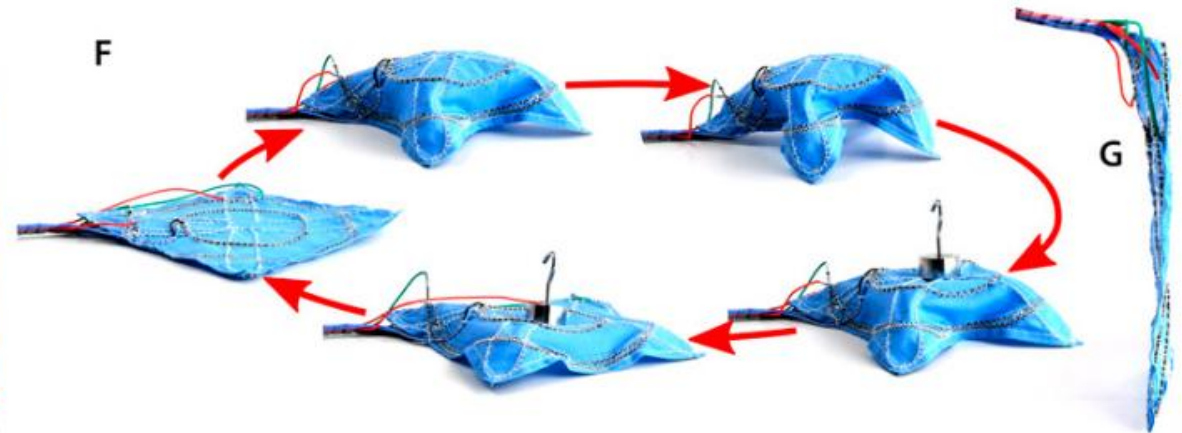
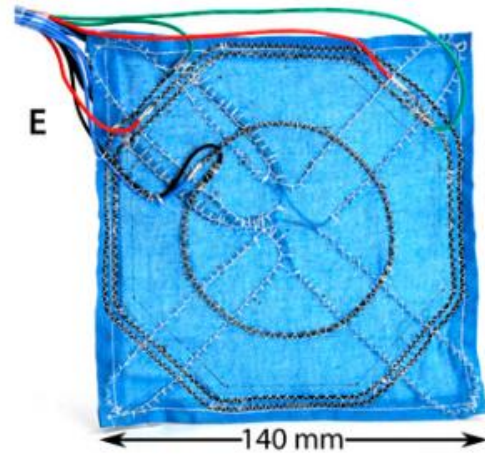


Straightening

([Deimel & Brock, 2013](#))

Reference project for prototype

Robotizing fabric by integrating functional fibers



Reference project for prototype

Soft Actuated Objects by Knitted Fabric



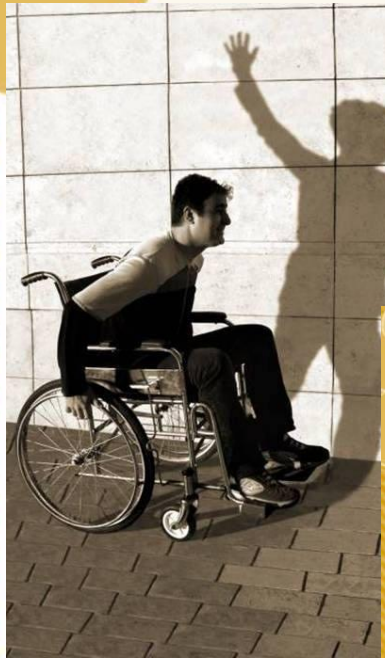
Lea Albaugh et al., 2019

For whom?

- Physically disabled individuals
- Occupational therapists and caregivers
- Adaptive fashion designers
- Wearable technology developers/Researchers

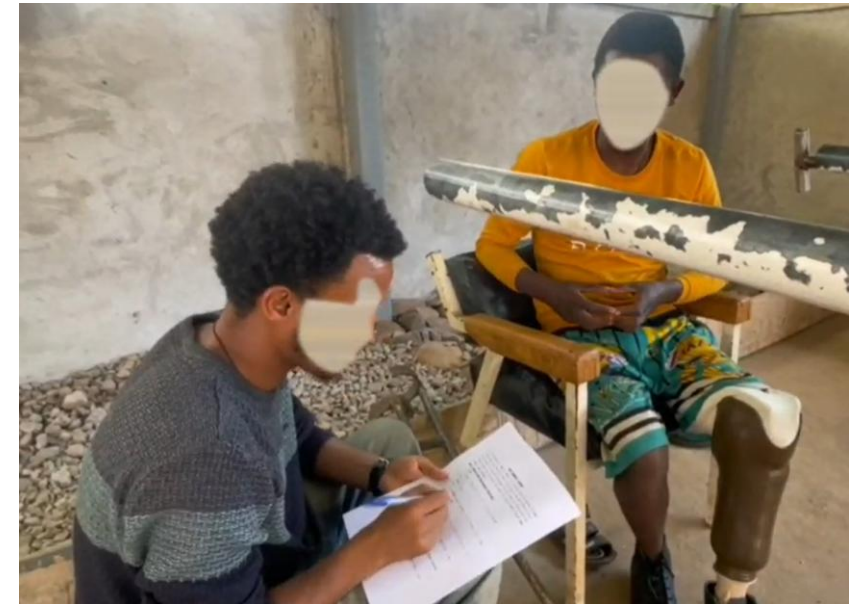


Mood board

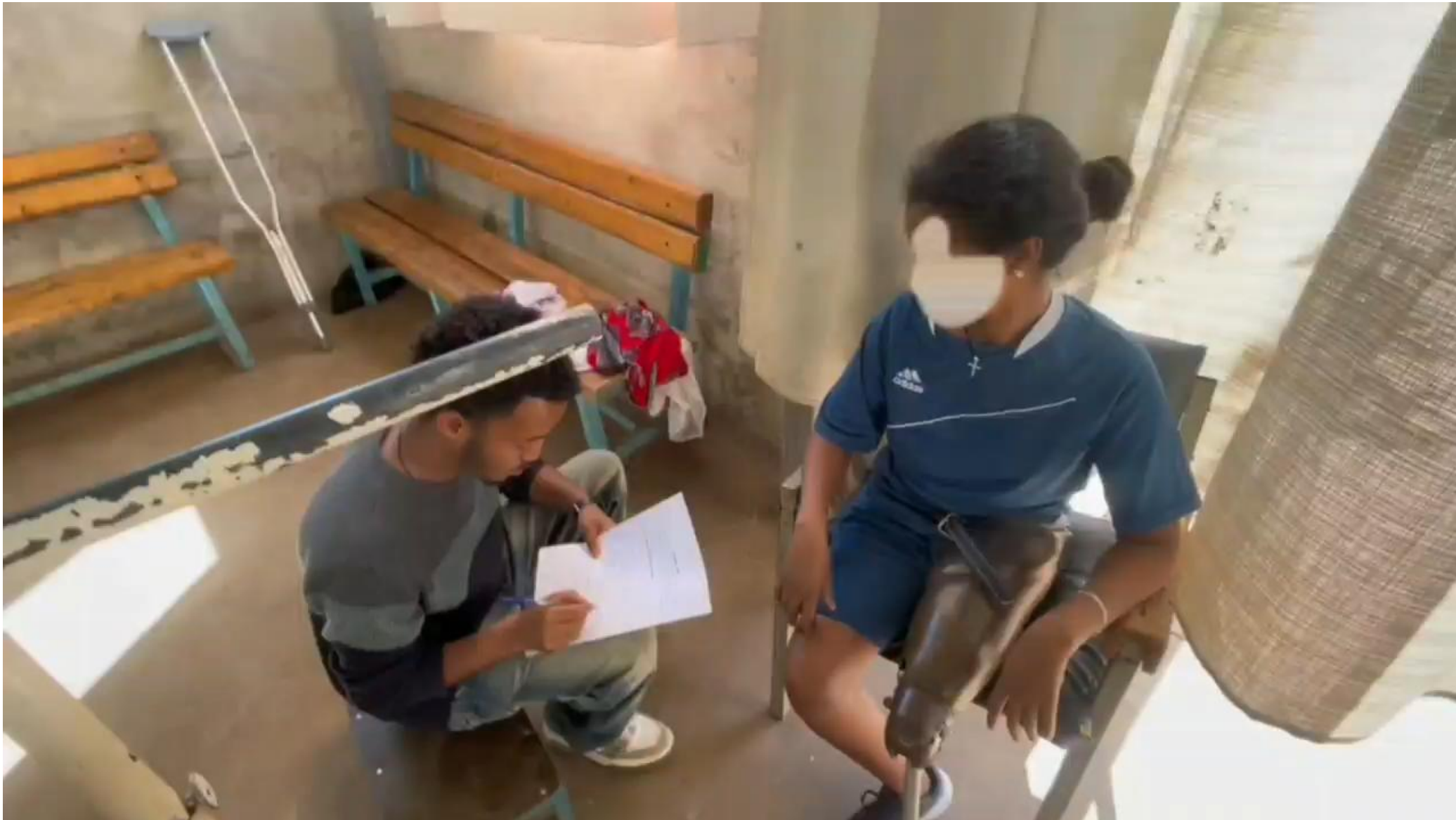


User testimonies

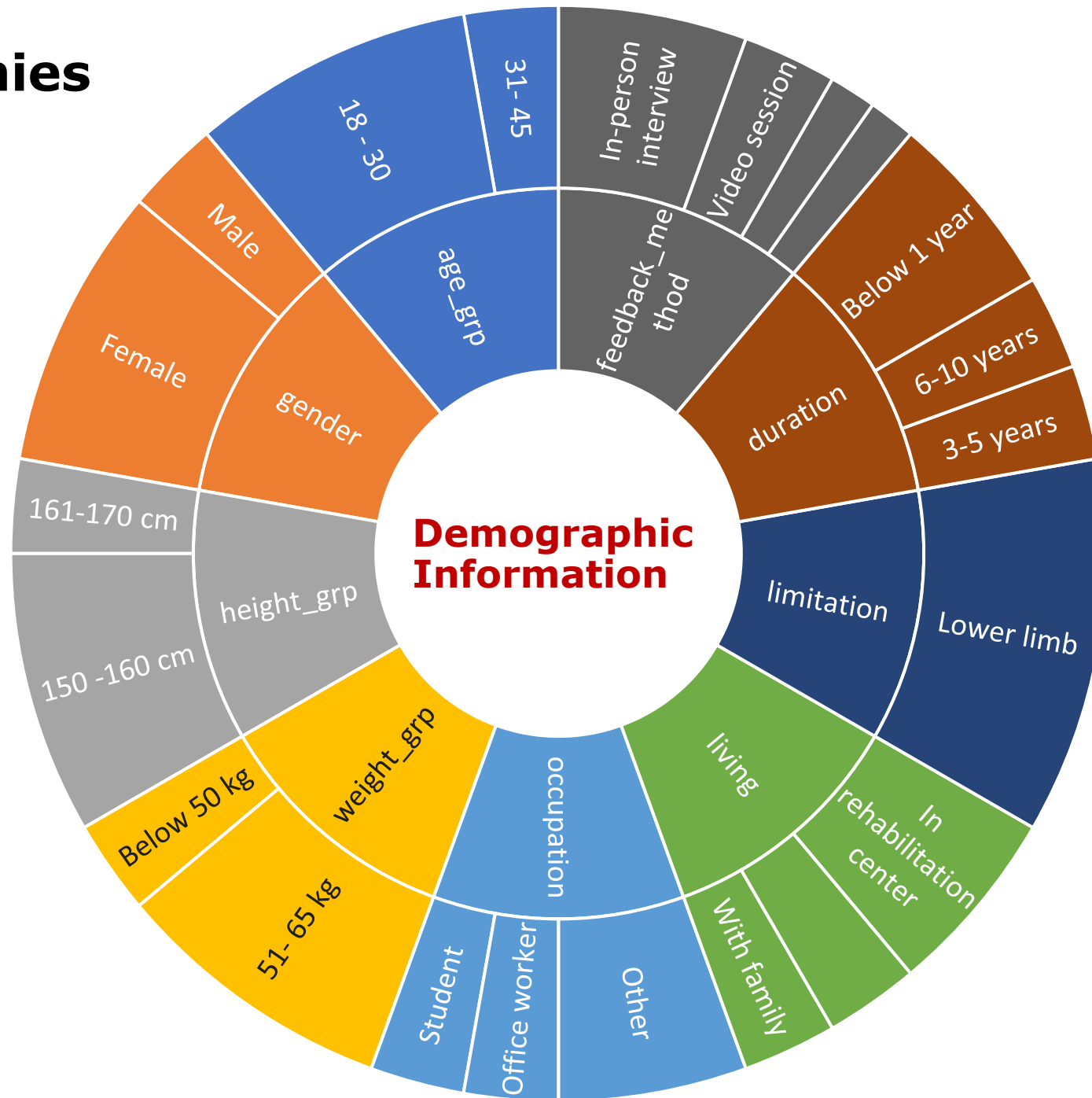
1. Identification
of the **basic
requirement**
of physically
challenged
persons



User testimonies

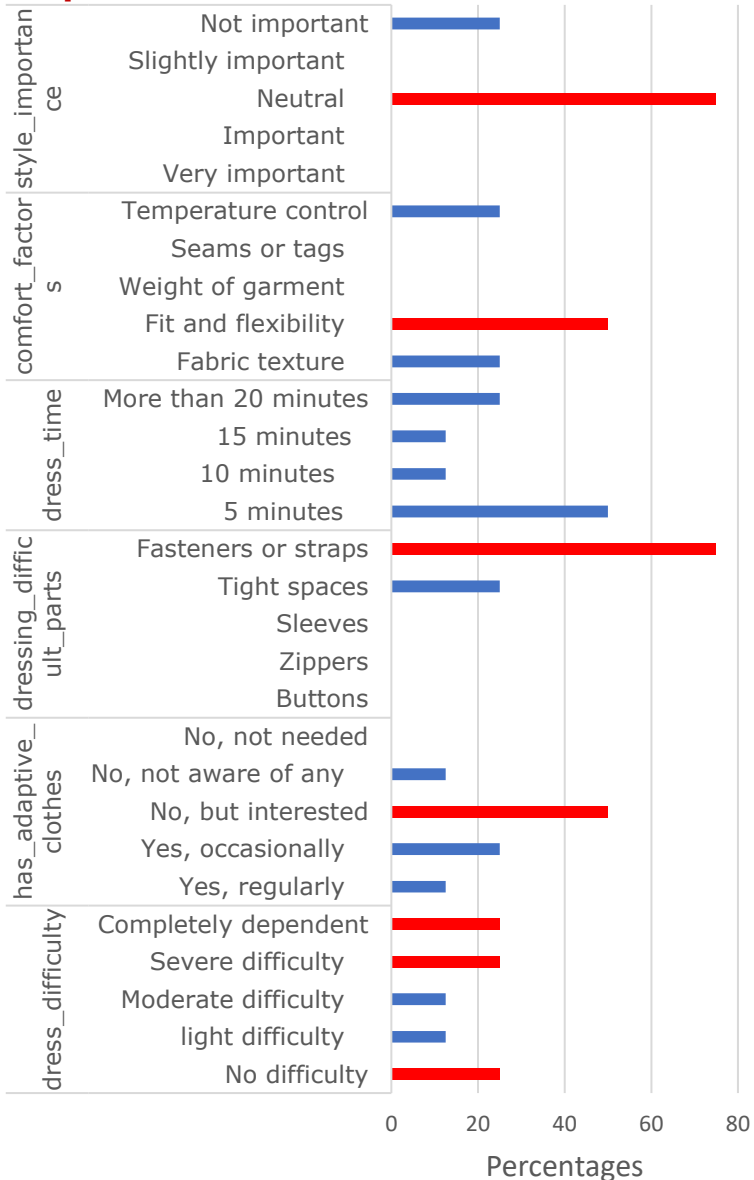


User testimonies

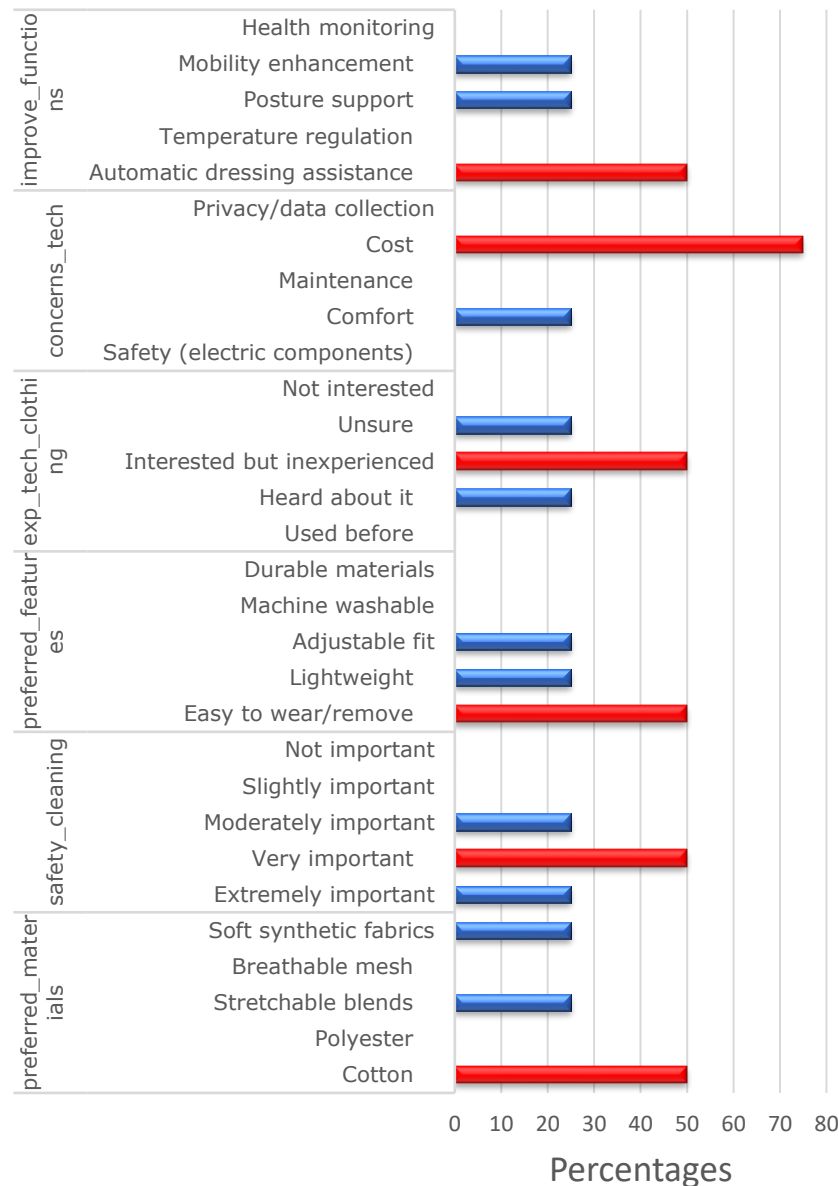


User testimonies

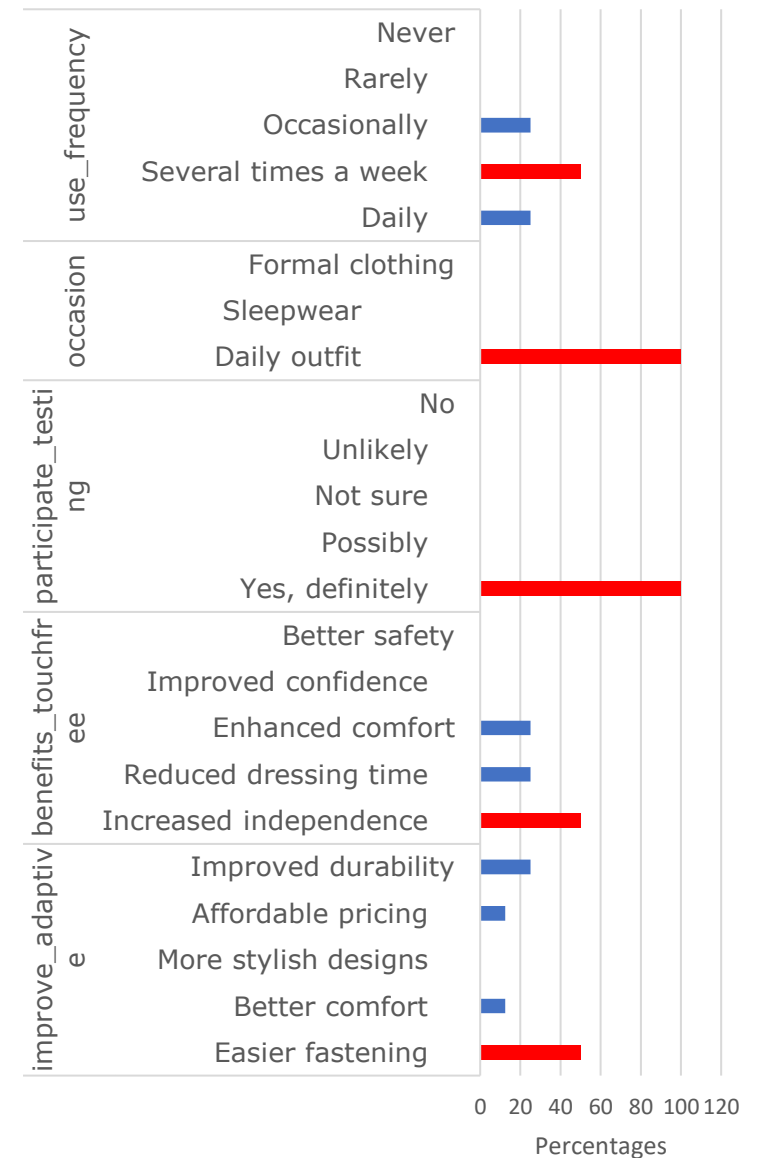
Mobility Information and Clothing Experience



Functionality, Preferences and Technology



Feedback and Expectations

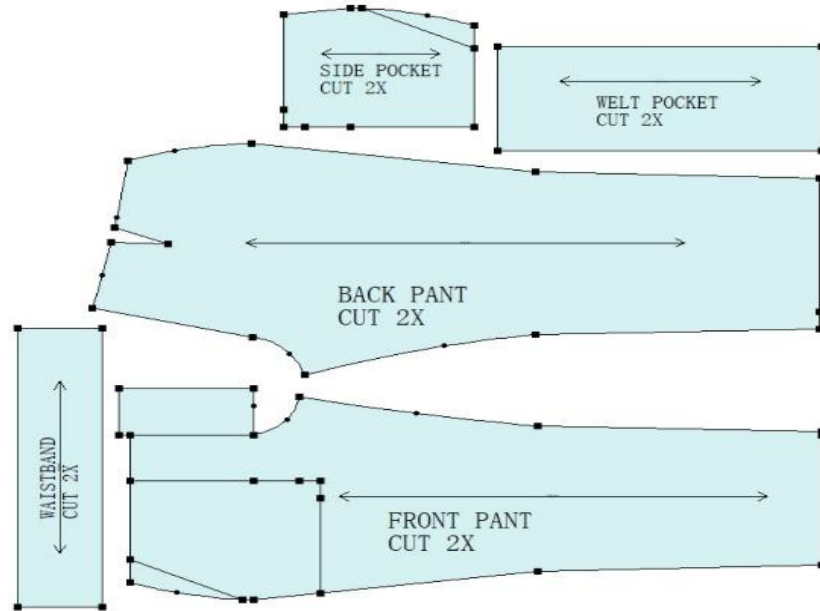


User testimonies Summary



- The study reveals that most people prefer adaptive clothing suitable for **daily wear** and frequent use throughout the week.
- Respondents emphasized the need for garments with **easier fastening systems** to enhance comfort and independence.
- There is a strong preference for **cotton materials** due to their **cost affordability, comfort,** and **ease of cleaning.**

Design & Fabrication



Product development

Design & Fabrication



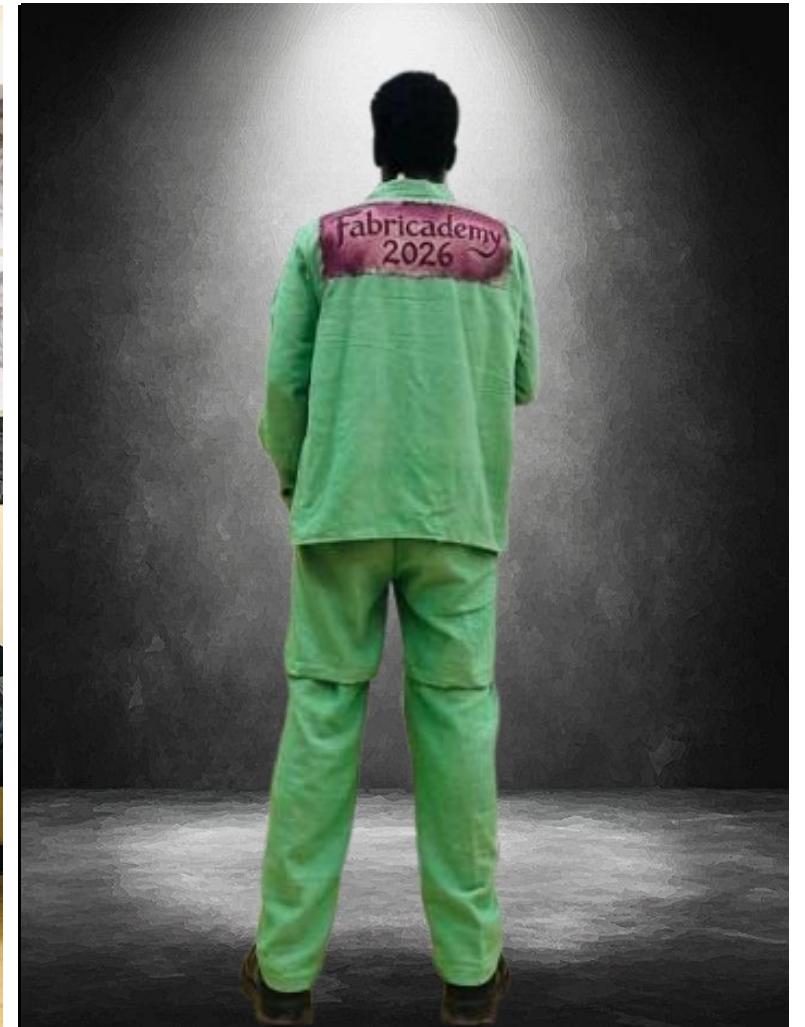
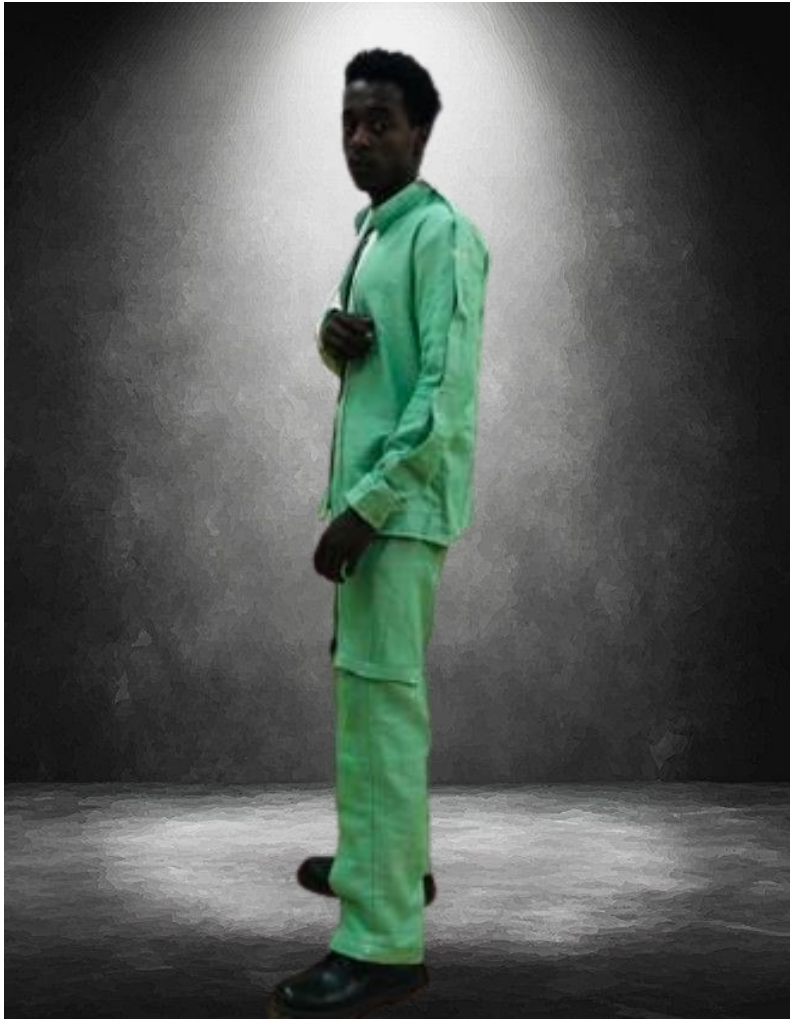
Test Fitness

Design & Fabrication



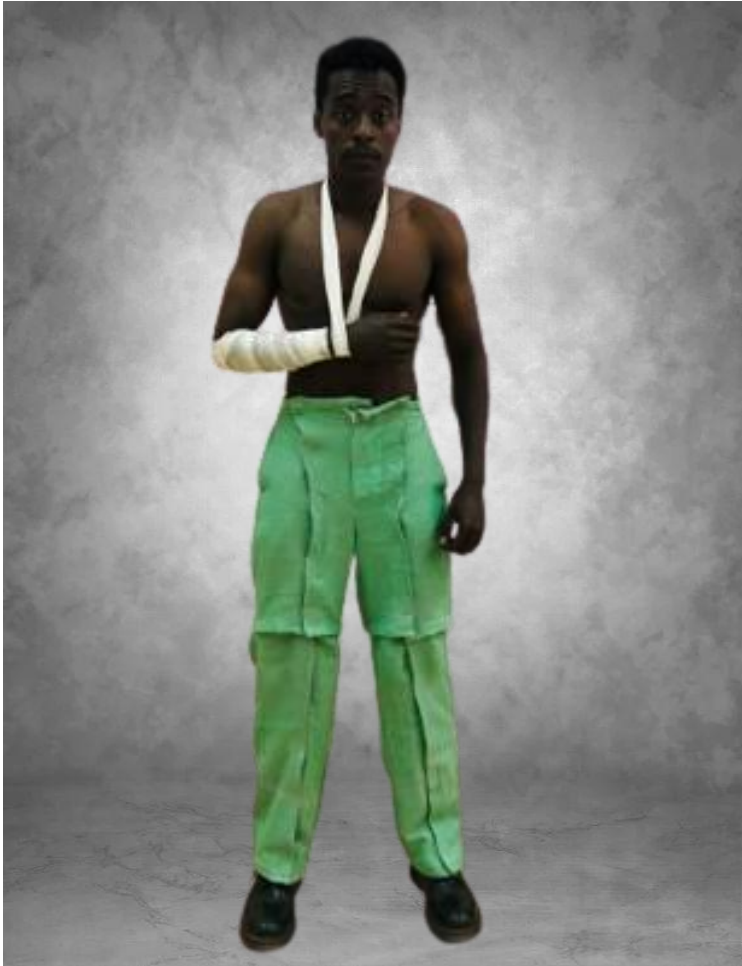
Test Fitness

Design & Fabrication



Test Fitness

Design & Fabrication



Test Fitness

Design & Fabrication



Test Fitness

Soft Robotics

Testing Textile Actuation



TPU coated fabric



Knitted stretchable fabric



Woven non stretchable fabric



Soft Robotics

Testing Textile Actuation



Soft Robotics

Soft Actuated Objects by Knitted Fabric



Future activities



- Further research on the textile actuation materials and
- Integrating them for assistive clothing

Conclusion

- **Adaptive fashion** is a tool for empowerment.
- By merging **soft robotics** with textile design, this research contributes to the creation of **inclusive, functional,** and **aesthetically pleasing garments** that enhance autonomy for people with disabilities.



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Thank You