
INCLUSIVE DESIGN FOR REGAINING LOST IDENTITY:

Accessible, Aesthetic and Effortless Clothing

INCLUSIVE DESIGN FOR REGAINING LOST IDENTITY:

Accessible, Aesthetic and Effortless Clothing

By:
Sukriti Tandon
(Bachelor of Design, GD Goenka University, 2016)

A critical and process documentation paper submitted in partial
fulfilment of the requirements for the degree of
Master of Design

Emily Carr University of Art+Design

2019



ACKNOWLEDGEMENT

I would like to begin by thanking the two non-governmental organizations, Samarthyam, India and Neil Squire Society, Canada for their vital support which was critical in order to undertake the present research. In particular, special thanks to Anjlee Agarwal and Suzzane Weins for the immense support they extended through the project. I benefited greatly from the excellent and extensive insights they shared. I also thank all the participants for taking the time to participate in my research and for their constant involvement and enthusiasm without which, this study could not have been possible.

I am incredibly thankful to my Supervisor, Professor Maxe Fisher for all the guidance, unwavering support and direction to help me throughout the project. Her invaluable guidance has been indispensable to bring about the successful completion of the undertaken project. The expert support of the Faculty at Emily Carr University of Art+Design and the positive and creative atmosphere created by all my peers was boundless.

A special mention to, Aaron Oussoren, for enthusiastic encouragement in developing the fasteners and for offering me the resources to develop them and useful critique thereof. It was a great value addition to the research.

My special gratitude to Gillespie Design Research Fund for partially supporting the research.

Last, but not the least, my special regards and thanks to my parents for their love, encouragement and undeterred belief in me that has enabled me to move ahead fearlessly and with confidence.

ABSTRACT

Inclusive Design for Regaining Lost Identity is a research project that aims to design and develop accessible clothing that is inclusive and fashionable to foster psycho-social well-being and to enhance the self-esteem of women with disabilities. The research explored inclusive design solutions for the saree – a traditional Indian garment for women, through a practice-led iterative methodology of designing and producing pragmatic and aesthetic sarees with enhanced ease of dressing and undressing. These sarees are intended to offer the participants a sense of independence and individuality whilst responding to their needs for self-expression.

Clothing for persons with disabilities frequently follows a medical model which focuses on their inabilities. Such experiences tend to aggravate feelings of inadequacy and lower self-esteem due to the limited choices of pertinent fashionable clothing. Ethnographic research was conducted with women in the age range of twenty to forty years with mild to moderate physical disabilities, including those with cerebral palsy, reduced dexterity and limb amputations. Investigations into apparel-related barriers they face and their expectations and desires about clothing pointed to a huge void in terms of designed inclusive clothing for women with physical disabilities. Self-efficacy emerged as a significant criteria for the selection of garments.

A series of informed study prototypes of adaptive sarees were designed and developed along with an exploration into the feasibility of 3D printed fasteners intended to alleviate potential feelings of frustration and deprivation while wearing a saree as well as acknowledging the cultural significance of ornamentation. The saree is an elaborate garment that requires precise draping, which makes the saree complicated to wear and inconvenient to carry, particularly for women with physical disabilities. For many women in India, the saree remains the customary dress, especially for work and occasions, yet minimal progress and advancement has been made to enhance its accessibility and ease of use.

This research aspires to provide inclusive design solutions that seamlessly embrace persons with disabilities, to elevate their agency and to challenge and change prevailing negative attitudes, misconceptions, and stereotypes in relation to their specific needs and desires.

KEYWORDS

Applied Design

Co-creation

Design Ethics

Inclusive Clothing

Participatory Design

TABLE OF CONTENT

1	INTRODUCTION	4
2	CONTEXT	8
2.1	Context	9
2.2	Significance of the Study	12
2.3	Research Questions	13
2.4	Scope and Limitations	14
3	METHODOLOGY	16
3.1	Phases	17
3.2	Ethical Consideration	19
3.2.1	Ethics	
3.2.2	Consent	
3.3	Phase 1: Precedent Research	19
3.4	Phase 2: Contextual Inquiry	21
3.5	Phase 3: Prototyping and Participant Testing	22
3.5.1	Ideation	
3.5.2	Prototyping	
3.5.3	Concept Testing: Focused Wear Test	
3.5.4	Prototyping of Fasteners	
3.5.5	Co-creation Workshop	
3.5.6	Concept Testing: Wear Test	
4	DATA COLLECTION AND ANALYSIS	38
4.1	Need Assessment	39
4.1.1	Challenges Faced by Women with Physical Disabilities	
4.1.2	Criteria for Selection of Clothing	
4.1.3	Suitability of Ready-to-Wear Clothing	
4.2	Wear Test	42
4.3	Outcomes	44
5	FUTURE DIRECTION	46
6	CONCLUSION	50
7	BIBLIOGRAPHY	56
8	APPENDICES	63

"I think your design solutions are respectful of our diverse needs. This saree may signify convenience to others...for me it equates to independence. I don't need to rely on the kindness of others to be able to wear what I want to wear."





01

INTRODUCTION



Clothing is a need of all human beings. It serves the important functions of protection and safety as well as modesty by covering the body, a code of decency. As a form of self-expression and bodily adornment, clothing is a reflection of personal taste, individual choices, and is a representation of feelings, mood and personality. Clothing is a form of visual conversation. These aspects affect the purchase and use of clothing (Kidd, 2006, Carroll & Kincade, 2007, Stokes & Black, 2012, Esmail et al., 2018). Clothing also holds social and cultural significance; establishing socio-cultural identity, situating oneself in one's environment, facilitating belonging and fitting in, and status identification.

While comfort and functionality remain important aspects of clothing, aesthetic qualities are equally meaningful. These are the desires and needs of all people, with or without a disability. In fact, the needs of the persons with disabilities are further

exacerbated, as many cannot simply select a clothing item off the retail rack and wear it due to variations in their body measurements from the industry guidelines, dependency on mobility devices along with some limitations and dysfunctions in their muscular movements. These are the reasons that clothing available in the mainstream fashion industry often does not fit well on the bodies of persons with disabilities and are difficult to don and doff. On the other hand, functional clothing available for them is often made with an assumption that clothes for persons with disabilities need to consider only their functional needs, and style/design details are not of meaningful significance.

Persons with disabilities are often looked upon as unique and being divergent from the social norm. Uniqueness or being different from most others can have both positive and negative aspects. The negative aspects of uniqueness are believed to be dependant on symbolic things like clothing (Wingate, Kaiser and Freeman, 1986). In case of persons with disabilities, their uniqueness is often equated to being incapacitated and incompetent. They are rarely considered as potential customers in the clothing industry. The practice of designing clothes often inhibits their autonomy,

as most clothing is produced without taking into consideration any atypical body form. Such clothes compromise their self-esteem since they cannot manage them independently.

The main purpose of this research is to bridge the gap between aesthetics and functionality in the design of clothing for women with disabilities. Aesthetics refer to the visual details of form, colour and textures within this thesis. User-centered inclusive garments were designed with enhanced functionality and aesthetics to positively respond to the emotional desire of women with disabilities to express themselves.



02

CONTEXT

2.1 CONTEXT

The rights of persons with disabilities are of high priority on the global agenda. The UN Sustainable Development Goals (SDGs) have embraced inclusion as integral to the transformation to a more sustainable future for all sought to be achieved by 2030. Persons with disabilities find specific mention in multiple indicators of the SDGs on reducing inequities, education, employment, inclusive cities, and data collection and implementation. Of crucial significance is Goal 10, which strives to reduce inequality within and among countries by empowering and promoting social, economic and political inclusion of all, including persons with disabilities. ("Sustainable Development Goals (SDGs) and Disability | United Nations Enable", 2019). These ambitious goals and targets drive the focus on inclusion by eliminating disparities and ensuring equality for all.

An inclusive design approach is equally gaining momentum worldwide. This approach is appreciative of diversity and envisions designing products and services for the widest possible range of users, such that they promote a state of being included or being an integral part of something (Zitzelsberger, 2005), thus ensuring equal access to all provisions of society.

Despite such promising provisions at the global policy level, persons with disabilities still largely remain discriminated against and excluded from. Negative attitudes are demonstrated towards them by their families, friends, and society. Hence, social and psychological risks arise due to their exclusion from society and the notion of being thought of as different (Wright, 1973, Pfeiffer, 2001).

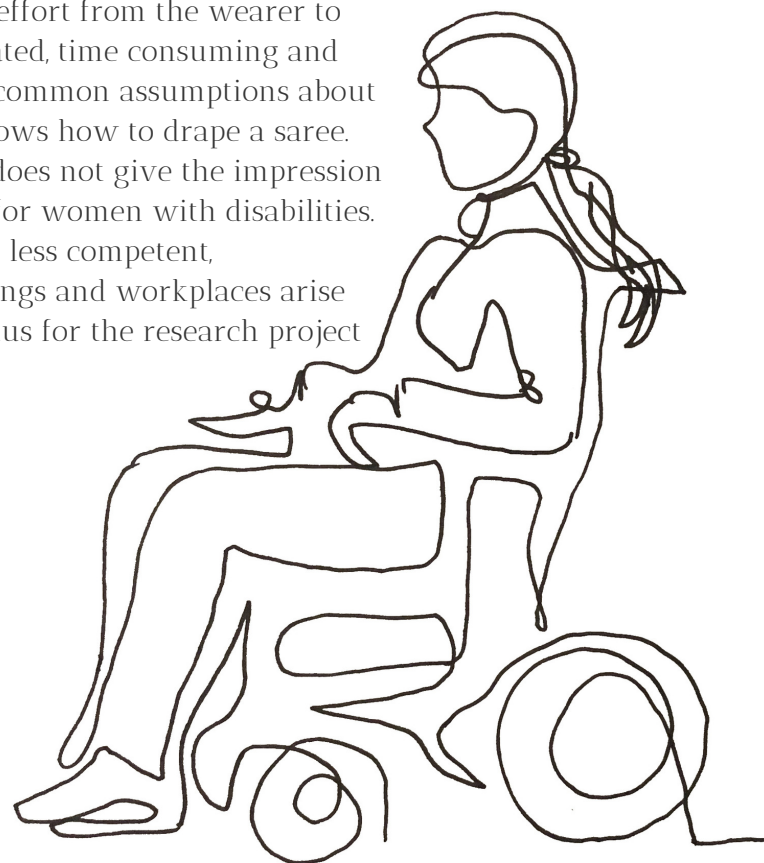
It is commonly observed that in routine conversations of and with persons with disabilities, their disabilities are noted before their individual personality and feelings, thus sidelining their identity. So much so that their disabilities start defining the products made for them. They are rarely expected to exercise choice, inclusive of their clothing. This is further exacerbated in the case of women with disabilities. Their disabilities often compound the gender-based stereotyping as 'dependents' and discrimination that women generally face in society. This invariably makes them feel invisible and has them question their own self-perception, which leads them to have a marginalized identity (Finkelstein, 1980, Zitzelsberger, 2005, Carroll & Gross, 2010). It has been noted that women with disabilities are specifically and more often neglected by the society. Despite their keenness and efforts to take charge of their lives and aspirations to feel included, to be involved in social activities, head out to work, etc., negative societal attitudes do not provide context for such endeavors. This furthers a sense of being inept for women with disabilities.

Despite having a desire to wear fashionable clothing, persons with disabilities are often unable to wear them. The existing options of adaptive clothing make them stand out and foster discrimination. Within the broad range of physical disabilities, there are persons with limited mobility and high level of dependency who rely on others for

their dressing. They are often forced to wear certain clothes (because of the comfort and ease in wearing them), which may not be what they would like to wear. Such experiences on a routine basis are likely to provoke upsetting thoughts, which implies that commonly available clothing adds to their woes (Kabel, 2016). Currently, there exists a wide gap between fashionable contemporary clothing and accessible clothing commonly available for persons with disabilities. Further, designers when experimenting with contemporary constructions of traditional designs/garments often overlook responsiveness, ie. being sympathetic and sensitive to the needs of persons with disabilities.

Shulman (2014) notes in an article in The Guardian that "fashion industry is letting down people with disabilities – to its cost." According to her, ethics and social responsibility in the field of fashion design are about "access to style" by developing affordable alternatives, for persons with disabilities, which are effective solutions and create positive change for consumers."Shedding old paradigms can allow people with disabilities to be treated with respect and admiration" expresses Paralympian Stef Reid.

The saree is a traditional dress and an integral part of customary dressing in India, both for work and occasions, for all women – with or without disability. It is a widely accepted garment especially during cultural functions, gatherings and other social occasions and work. Though the saree is an epitome of grace, self-confidence and elegance, it takes some effort from the wearer to put it on properly. Draping a saree is a little complicated, time consuming and requires some practice. Additionally, there are some common assumptions about the saree. It is assumed that every Indian woman knows how to drape a saree. The visual appearance of a woman wearing a saree does not give the impression that it is a complicated garment to don, particularly for women with disabilities. Due to these challenges, feelings of being left out and less competent, particularly when attending social functions, gatherings and workplaces arise (Klepp and Rysst, 2016). This current gap is the impetus for the research project Inclusive Design for Regaining Lost Identity.



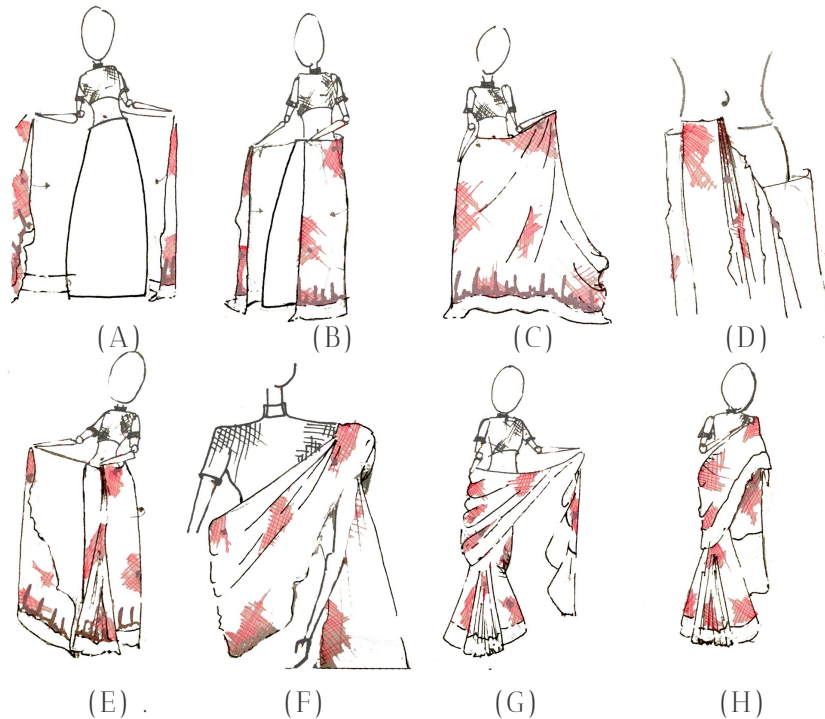


Figure 1 :Step-to-step on how to drape an unstitched, unaltered, traditional saree

The entire ensemble of saree comprises of three separate pieces, a blouse, an underskirt and a saree of a length of 6 meters. (A) After the blouse and the underskirt are worn, (B) one end of the saree is tucked into the underskirt, and (C) a full round is draped from right to left is made tucking the fabric in the underskirt. (D) About five to six pleats are formed which are approximately the length of one hand span, (E) the pleats are gathered together and tucked in the underskirt facing left in the exact centre of the front of the body. (F) The loose end of the drape is wound around the body again and (G) thrown over the shoulder covering the midriff in a slant and (H) leaving the end of the fabric hanging nearly till the back of the knee. This part of the saree is known as palla. The palla can be loosely draped over the arm or pleated to sit on the shoulder.

The research is guided by the social model of disability which suggests that barriers faced by persons with disabilities are not solely due to their impairments, but are due to the barriers in their environments, inclusive of physical, attitudinal, communication and social barriers. The underlying principle of the project is that every individual should be able to access life the way they wish to and should not have to compromise their desires due to their disability.

The core of the research lies in challenging the current perceptions of clothing for women with disabilities and is intended to promote inclusion with the construction of contemporary functional clothing to regain their dignity and identity. The designed garments in this research project are based on the cultural and social context of the Indian saree and are aimed to positively respond to the emotional needs and desires of women with disabilities by designing clothing to express themselves, have greater independence and a sense of individuality.

2.2 SIGNIFICANCE OF THE STUDY

The research aimed to understand the barriers faced by women with disabilities in relation to clothing and to co-create well-designed accessible sarees. It was intended to expand their choice of expression and the feelings they experience in wearing garments with enhanced accessibility. This approach is well aligned to the 'rights-based approach' (UNICEF, 2019), emphasizing that they have rights equal to all others. Manzini (2006) proposes that designers can have an influence on the social construct of well-being. He makes a strong case for developing design solutions which are truly informed by ethics and are capable of promoting a sustainable model for 'well-being'. McBee-Black (2016) and Ha-Brookshire (2018) corroborate this proposition and further emphasize the contribution of clothing in enhancing the self-efficacy of persons with disabilities and in positively influencing the social expectation of their well-being. Well-designed clothing has also been found to be an enhancer of self-esteem and an enabler for women with disabilities to be an integral part of an inclusive society (Chang, Hodges & Yurchisin, 2013).

Disregarding the increasing significant recognition of the need for inclusive clothing, sufficient attention has not yet been paid to promote inclusive design practices. Clothing stores do not cater to the specific needs of women with disabilities. It is difficult for them to find clothing that is suitable in terms of style and ideal fit. The other alternative, i.e., altered clothing does not offer the preferred solutions (Kidd, 2006). Moreover, retail store designs often do not allow easy access to persons with disabilities, which further escalates their exclusion (Klerk and Ampousah, 2002, Chang et al., 2009). Such experiences aggravate the feeling of insufficiency and exclusion.

Pulin (2009) argues that many products that are specifically designed for disabilities lack personality and tend to neglect the individual person and their identity, leaving them with fewer product choices. According to him, designs should take into account the lived experiences of persons with disabilities when creating products that have a human-centric approach and effectively meet their needs.

The manner in which off-the-shelf work and occasion wear is designed generally caters to the typical body forms which follow size guidelines developed by the clothing industry, and does not take into consideration body forms that lie outside of the typical body. These types of clothes often inhibit the autonomy of women with disabilities and compromise their sense of self-worth as they are unable to manage independently.

Although some adaptive clothing is available for women with disabilities, very limited options exist of well-designed work wear, and almost negligible occasion wear. The review of literature and the current practices pointed out that, so far, little has been done in relation to enhancing the functional accessibility of the saree. Adaptive clothing is mainly designed to cater to functional requirements and does not pay attention to aesthetic considerations. Also, adaptive clothing or customized clothing is often priced at a higher end, keeping it out of reach for those who need it the most.

Accessibility can be increased by taking into consideration the varied needs and broader characteristics of different persons when designing. Persson et al. (2004) state that the main aim of designing must be to create aesthetic and functional objects and environments that improve the quality of life. They also suggest that for a design process to be participatory, the target users should be active members of the entire process. Martin and Martin (2012) envision bulk production of products and clothing for persons with disabilities following the principles of universal design and an understanding of ergonomics maintaining the experience of the participants as the key criteria to be considered in the process.

The hope would be that the designs developed in this research would eventually have a positive influence on the perceptions of women with disabilities about accessible clothing. The motivation is to bring a change in the practice and design of inclusive clothing, broadening it from the current limited approach of focusing primarily on functionality to contemporarily designed functional clothing for every social context from work wear to occasion wear. The long term goal is to promote inclusive design strategies in the mainstream design industry.

2.3 RESEARCH QUESTIONS

The research was intended to study the clothing needs of persons with disabilities. However, precedent research revealed that there are different disabilities, and within each disability there is a range and that the clothing requirements vary according to the type and degree of the disability. This new knowledge enabled an understanding that for this exploratory research project, it would be beneficial to narrow down the scope of the research. The objectives of the present research are:

To investigate how women with physical disabilities perceive themselves in relation to contemporary design and the barriers they face in relation to clothing.

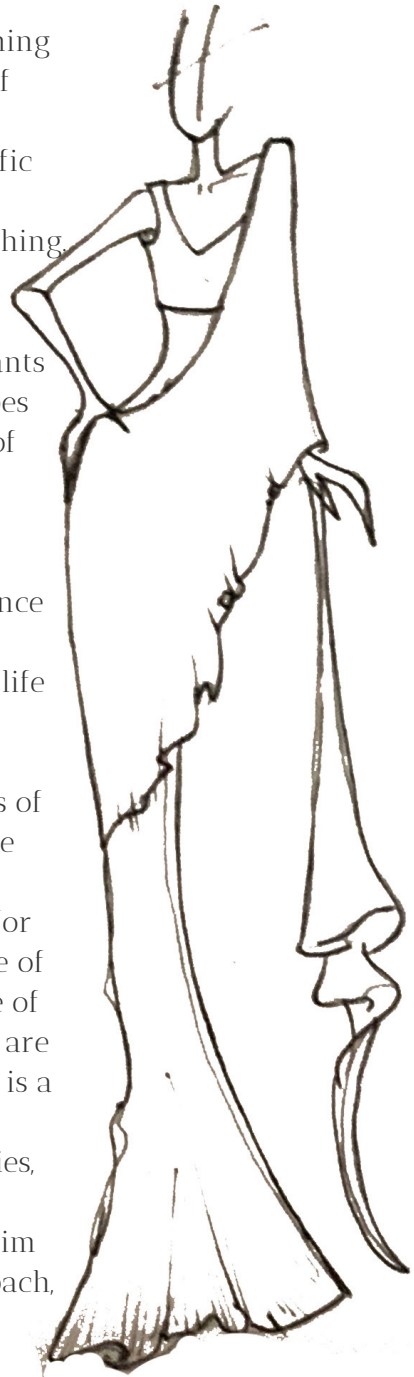
To apply the gained knowledge to design and develop saree prototypes that consider both functional and aesthetic qualities thereby increasing the psycho-social and emotional well-being of women with physical disabilities while giving them agency to creatively express themselves through their clothes.

2.4 SCOPE & LIMITATIONS

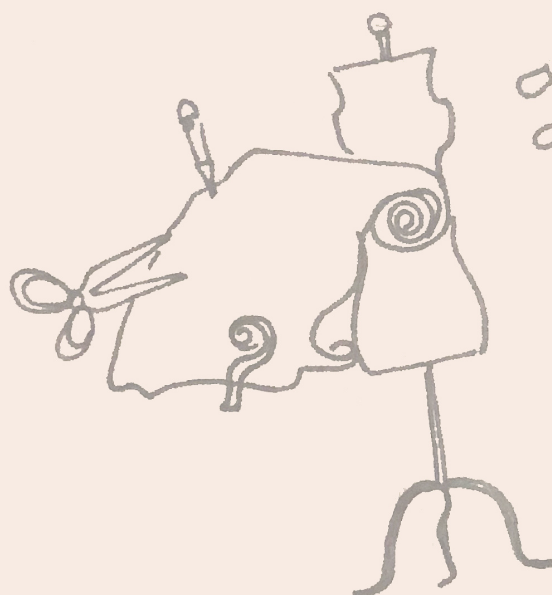
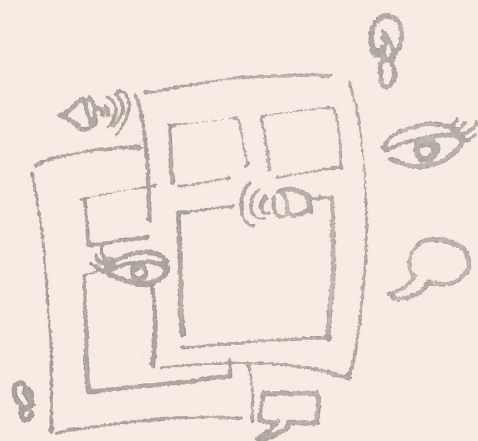
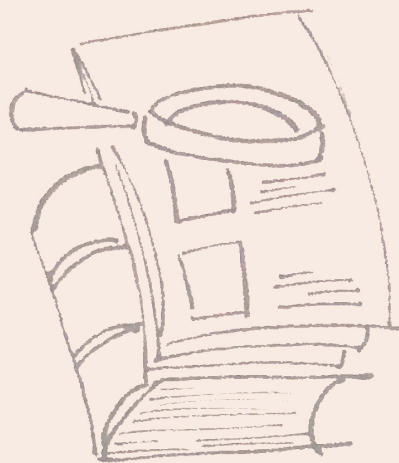
This research fosters an understanding of real clothing needs, both functional and aesthetic, of the target group of women and the specific factors that are significant to designing clothing for women with disabilities. This specific understanding can augment and expand existing foundational knowledge related to current accessible clothing.

The research followed the principles of inclusive design. A range of abilities and disabilities of the participants were divided into groups of common issues. The prototypes were then designed to respond to these different groups of common issues, thus making some sarees which could be useful for a certain type of impairments. The product development insights gained through this research have future implications for inclusive design practices to enhance the ease of wearability and to align with contemporary design details of inclusive clothing to improve quality of life for women with disabilities.

It is recognized that the research is limited in terms of the age range, the types of disabilities and their range. The disabilities and their abilities and limitations were deliberately selected as the criteria for this research and for their cultural and gender specificity. From the perspective of the broader implementations from these results, the scope of this research thus remains limited, considering that there are different disabilities and within each disability also there is a range. Each person with a disability is likely to have variations in physical characteristics, differences in abilities, and hence, varied needs. This research also prompts the question of whether universality could or should be an aim of adaptive clothing, following the inclusive design approach, since the needs of each person with disability are very specific.



Further, while this research project successfully developed contemporarily designed accessible sarees, questions remain with respect to scaling up of such garments. For example, can an adaptive saree be made available as 'off-the-rack' choice, considering the customization of length, adjustment of waist, etc. required to suit the specific needs of the wearer? If not, then does it imply that each time a woman with a disability desires to wear a saree, she will have to hunt around for a designer to customize it for her?



03

METHODOLOGY

3.1 PHASES

The research process was divided into three main phases.

Phase One. Precedent Research - extensive search of relevant literature and existing projects relevant to the research topic.

Phase Two. Contextual Inquiry - understanding the real-life situation of the participants, barriers that participants struggled to navigate in their daily lives; their expectations from products, their knowledge of available clothing options, and understanding of the problem space and feasible solutions for the same.

Phase Three. Prototypes and Participant Testing - design and development of possible solutions to clothing related barriers, co-creation workshop followed by wear tests.

The project followed a qualitative research approach whilst incorporating a combination of methods, which consisted of a questionnaire, an interview and co-creation workshops. The research adhered to the principles of applied research such that the designed products aim to solve a problem are functional and purposeful. Design thinking methodology was used. It is a method to respond actively to the needs of the end user with an intent to provide solutions. The five main phases of this methodology are empathizing, defining, ideation, prototyping and testing.

The initial phase of the research process was exploratory in nature. Preferred requirements of clothing were gathered from women with disabilities. Observation trials were experienced. This was followed by participatory design research. Insights from interviews and observations were used to develop, design and produce prototypes of accessible garments. The participants actively participated in this research through design study in co-creating the prototypes to inform the design solutions.

The purposive selective sampling method was followed for this research. This method entails a specific selection of experiential rich and knowledgeable participants suitable to the scope and objectives of the study with a keen interest in taking part and offering fruitful suggestions. This method of sampling has been found to be most effective when a certain cultural domain is to be taken into consideration. Although, the conclusions drawn and the applicability of the results can sometimes be questioned it is of value to consider that a random sample would not have provided significantly valuable information which was being sought from the participants.

As this research explored innovative ways to design adaptive sarees with contemporary design details, a representative sample of active women in the age range of twenty to forty years with mild to moderate range of physical disabilities, particularly, limb amputations, reduced dexterity and cerebral palsy was determined. The mild to moderate range of disability, (mild being the range in which the participants had some restrictions in movement but did not need any assistance. The moderate disability being the range wherein participants were dependent on assistive devices), was identified as a criterion for this research sample selection. For the purpose of this research, it was important that the participants had some control over their movements and the ability to dress and undress.

The age group of twenty to forty years was chosen for the ways in which women in this age group frequent social events and dress for their active life (outside of home) as different from the older women. They are also more likely to be interested in wearing contemporary designs. The saree is a customary dress for adult women in India. Young girls and teenagers commonly do not wear a saree, and would not have experienced relevant difficulties to contribute significantly to the research. Therefore, the lower age bar of twenty years as the selection criteria was chosen as appropriate. The upper age bar of 40 years was more informed by general discussions of the research topic with a saree-wearing population in India. It revealed that older women were accustomed to the traditional saree did not show an eagerness, and may have had inhibitions in accepting contemporary designed sarees. This is reflected in the manner in which women in different age groups are usually attired. Taking cognizance of these factors was decided to limit the age range from twenty to forty years as significant and pertinent of the aims and intentions of the research. In addition, the assumption is that women in this age group are more likely to be in charge and have meaningful control over their decisions, which in turn, influences their choice making about clothing.

Furthermore, privacy laws often prevent listings of persons with disabilities. The NGOs approached for the research shared the questionnaires with their contact lists. Women who self-identified themselves as interested in the study were finally chosen as the participants.

This was an exploratory study, with not much precedent research available as the evidence. Therefore, in the early stages of developing the research, the initial thought was to cover all disabilities. However, review of literature informed that there is a wide range of disabilities. Recognizing that the present project was only a scoping study, it was considered appropriate to narrow the sample subjects most appropriate to the study, who could provide the necessary information to address research questions, and to ensure that it should not be too difficult to recruit or keep the participants in the study.

It was hypothesized that women with permanent disabilities would respond more positively towards functional clothing due to their long term challenges, as compared to women with temporary disabilities, who are likely to view their condition as a stage that will pass in sometime. Even though the participants of the study represent a narrow range of permanent physical disabilities in mild to moderate range, the efforts made in the research to explore and respond to different humans' needs and the achieved design outcomes to explore and respond to different humans' needs have the power to transform the lives of not just those with physical disabilities but anyone in pursuit of ease and efficiency, including persons with temporary disabilities (due to accidents or injuries), and for any other woman, such as those rushing to work.

Furthermore, the disabilities of participants are noted only for informational purposes. The purpose of the interviews was not to compare individuals with disabilities and their respective dressing needs, but rather, the purpose of this exploratory study was also to understand and consider the dressing ability and behaviour of disabled consumers in a general sense.

In Phase Two of the research, a selection of non-governmental organizations working for persons with disabilities were approached to seek their support in reaching out to women with disabilities. Two of the organizations, namely Samarthyam in Delhi, India and Neil Squire Society in Vancouver, Canada agreed to support the research. The participants were contacted with their support via an open-ended questionnaire posted on the social media pages of the NGOs. The contact details of the researcher were given in the proforma for easy contact by women who were interested to be a part of the research, the co-creation workshop and wear-test to follow. The participants finally selected were intellectually capable and legally competent adults who gave consent for participation in this research.

From among the participants in Phase Two, a total of five women were selected for Phase Three, based on the similarities and differences in the specificities of their movements, gesticulations, variation in their fine motor abilities, and interest in wearing saree. Since this was a small sample, the intention was to select women with different abilities and movements within a broad range of the selected physical impairments. This selection was made so that the garments developed in the project would not be limited in their responsiveness to a typical impairment but had the potential to respond to a range of impairments through a possible family of products that could be derived from the prototypes.

3.2 ETHICAL CONSIDERATIONS

Persons with disabilities often face exclusion and discrimination. Their product options are limited and often do not take into consideration the vast range of their requirements, which increases the emphasis on their particular disabilities and highlights their inabilities. This can at times lead to feelings of distress, apathy and self-consciousness. This research entailed asking the participants several questions pertaining to their disability and the barriers they face, both physical and attitudinal. Such questions could have brought out suppressed emotions and caused some psychological distress. Due care was taken at the time of interview to ask questions and receive responses in a non-judgemental manner, and avoid escalation of any negative emotions.

The process of testing the prototypes in itself did not involve any major physical risk. However, as the sample group already had certain physical barriers, some difficulties did arise during wear tests. These difficulties were neither perceived nor communicated to the participants as their inadequacies. Instead, they were understood as challenges that should be addressed by enhancing the prototypes.

3.2.1 Ethics

The primary research was conducted in accordance with the project proposal approved by the Research Ethics Board of Emily Carr University of Art + Design.

3.2.2 Consent

Full disclosures about the research and the involved processes were communicated to the participants of the study. Their consent was confirmed before and during the research. The Consent Form was reviewed by the participants before any participatory session to ensure they understood the activities and to assure them that their personal information is secure and will not be disseminated without their prior consent. The participants were informed about their right to conclude their participation in the research at any time, if they wished to.

3.3 PHASE ONE PRECEDENT RESEARCH

Precedent research involved investigating and synthesizing existing theoretical, methodological and practical pools of research and projects of relevance to apparel for persons with disabilities and examining past work related to the field of study. Visits to the NGO's and a wide spectrum of primary and secondary literature, additional interviews, and available data analysis were utilized for this purpose. An overview was gained in regards to the concerns related to the disabilities in different spheres: social rights, access, fashion, cultures and mobility. A comprehensive understanding was developed about the impact of mild to moderate physical disabilities, including on the physical movements and abilities and psycho-social and emotional well-being of persons with disabilities, in order to design and cater to the needs of the participants.

A review of the precedent research was completed to comprehend how other researchers has addressed inclusion and how they have attempted to tackle existing exclusionary practices. The review highlighted that although there was sufficient literature available regarding persons with disabilities, their needs, rights, education, etc., it revealed a limitation in published research specifically with respect to adaptive clothing and inclusive design. Of the available resources, many were either research work undertaken as a part of Master/Ph.D. programs or were blogs and magazine articles. These were further limited in scope and in offering pragmatic solutions. This pointed to a dearth of published research on clothing for persons with disabilities.

A dipstick review of the existing design practices for adaptive and accessible clothing was also undertaken to ascertain the spectrum of available product choices and what solutions had been identified and whether these could potentially be incorporated into the construction of an inclusive saree. The review corroborated the inadequate emphasis on inclusive clothing. A wide gap was observed between the accessible clothing and contemporary design details which, for this research, meant developing construction details, looking at garments beyond just their basic shapes or ways of stitching, fits, elements and replacing the traditions of garment making with contemporary ways of addressing fashionable clothing (Dlf.org.uk, 2019).

Results from Phase one highlighted the need to improve the availability of well-fitted, fashionable and culturally relevant clothing to accommodate a group of consumers who have been ignored as potential clients by the clothing industry to date. Involving the participants in the development process of the garments emerged as the method of choice.

3.4 PHASE TWO

CONTEXTUAL INQUIRY

Incorporating an ethnographic method, interviews were performed to gain in-depth knowledge of the views and needs of the participants of the study.

As a first step, the questionnaire method was utilized. A consolidated questionnaire was prepared which comprised of open-ended, generic questions to gain some fundamental insights to the needs and desires of the participants. It was formatted as a coloured layout to make it attractive, hoping that it may catch the attention of the expected respondents, thereby resulting in a higher rate of response. A black and white version was also prepared for persons with colour or partial blindness. Simultaneously, there was an online version created for Survey Monkey. This version provided read aloud options as well. These alternatives were provided to enhance the reach and ease of responding. The questionnaire was then posted on the social media platforms of both the NGOs. Printed copies of the questionnaires were also placed in the lunchrooms, receptions and activity rooms of the two NGOs. A total of twenty-one questionnaires were received, some of which were partially filled. The returned questionnaires were further used to reach out to the participants for in-depth interviews.

In-depth need assessment was conducted using semi-structured interviews to gather focused qualitative data about apparel-related barriers faced by the participants in their daily life, their expectations and aspirations about clothes and how contemporary design is perceived by them. Needs assessment research is the process of finding, assessing and responding to the gaps in the existing situations and desires. For the present need assessment, the participants were asked about the criteria for selecting their clothes, what challenges they face in dressing and if they would be interested in adaptations of clothing that would assist them in their routine. If so, what features they would be interested in to improve their dressing/donning routine?



(i) Trying and testing various readily available fasteners

(ii) Post-it map of the challenges faced and needs of the participants

Figure 2: In-depth need assessment and analysis

As the non-governmental organizations were being contacted to reach out to the participants, the researcher came across some professionals in the field of disability. Key insights about the disability sector were also gathered from them through informal interviews.

3.5 PHASE THREE

PROTOTYPING AND PARTICIPANT TESTING

Based on the learnings gained in the preceding phases, Phase three focussed on designing and developing of possible solutions for the identified clothing-related barriers and user testing.

The question then arose of how to address the clothing-related barriers commonly faced by the participants. Experts in the disability sector have successfully argued for using the social model to address barriers, instead of using the previously followed medical model of disability. The medical model considers disability and impairment to be a barrier or problem with the person and tries to fix the disability. On the other hand, the social model emphasizes that persons with disabilities face barriers not because of their impairment, but because their needs are not taken into consideration while designing and developing products. It examines ways of removing barriers that restrict their choices (Finkelstein, 1980, Francis & Silvers, 2000, Oliver, 1990). If we change our design practices in such a way that persons with disabilities can also have equal access, then their participation and choice and control over their own lives will enhance, irrespective of their disabilities.

Designs should be responsive to the needs and desires of persons with disabilities as everyone merits to be comfortable in the world without any barriers to their equal participation (Oliver, 1990, Goering, 2015). Furthermore, Dilnot (2009) opines that design should not be limited to the narrow view of 'creating something artificial', but be guided by the underlying principles of 'possibilities that design holds' and that "ethics is internal to design". According to Dilnot, the purpose of designing should be for universal benefit, while upholding ethnicity and ethics in design.

Researcher Lamb (2001) also questioned the widely held thought that getting dressed and undressed is a problem for persons with disabilities, simply due to their unique abilities. According to Lamb, the way apparel is designed is equally responsible for the barriers they face. It is opined that disability should be studied as a social construct rather than a medical condition for an individual and the emphasis should be on addressing the external barriers that cause inaccessibility.

The social model used by Lamb (2001) states that the participants of research hold a lot of significance and helped develop the conceptual framework for the construction of prototypes for different contexts within this research.

3.5.1 Ideation

Shearer's Design Thinking Framework (2015) was used to generate potential and beneficial solutions envisaged for the project by asking "what if...?" questions at five different moments of design process experiences. These 'what if' questions offered opportunities to create different kinds of generative propositions until the designer reached a satisfactory design by following a constructivist approach which involved the development of knowledge by exchange and adaptations of experiences of the participants.

The process of ideation encompassed three stages :

- (i) The first stage was inspiration. It involved an understanding of the basics parts of a saree and the entire draping process. Ideas evolved and continued to generate solutions as to how to ease the donning and doffing of saree, and whether some parts of the saree could be pre-stitched in order to achieve this.
- (ii) The second stage was brainstorming. This involved sketching numerous ideas and self-draping exercises to examine possible places of adaptations and amendments to the traditional saree.
- (iii) The final stage was implementation including the development of pre-stitched saree options alongside devising fasteners to reduce the time and effort spent on draping the saree.

Following the framework of Shearer, there was an opportunity to arrive at solutions by following two avenues of design thinking. Firstly an intensive re-framing of the problem in order to bring a change, by proposing a set of assumptions to work out design proposals. Secondly, a phase to develop an understanding of the proposed assumptions by absorption and adaptability. Eight to ten design options were thus created during this process. Next, a series of design sketches and prototypes were created in the following phase to accommodate the suggestions offered by the participants to enhance the comfort of dressing and undressing in parallel with also their desired aesthetic qualities.

3.5.2 Prototyping

Informed by the principles of universal design (Connell, et al, 1997) the following inclusive design principles served as the basis to design the prototypes:

- (i) Equitable use, viz. the products are designed taking into consideration the vast variety of needs and to avoid injustice against users.
- (ii) Flexibility in use, viz. the products are designed taking individualistic desires into consideration while accommodating a wide range to suit multiple abilities.
- (iii) Simple and intuitive in use, viz. the users are able to easily apprehend the use of the products.
- (iv) Perceptible information, viz. the designs are self-explanatory and communicate well with the users.
- (v) Tolerance for error, viz. the designs eliminate possible complexities and have the capability to curtail accidental risks.
- (vi) Low physical effort, viz. the products are comfortable to use and do not cause any exhaustion and exertion.
- (vii) Size and space for approach and use, viz. the products allow enough space for mobility, reaching, bending; are flexible and adjustable; and help support users' needs and body sizes. For example, in case of garments, its parts, such as the fasteners should be easy to reach and grasp.

After generation of ideas began the process of developing prototypes. Quick prototyping methodology was used to develop the study prototypes. This is a low-fidelity method of developing usable/wearable physical prototypes which could be tried out by the participants for easy evaluation and critique to follow an iterative loop of construction and feedback. This method also provides additional options for easy customization and to reduces uncertainty. Quick prototyping was undertaken by developing creative toolkits, try-ons, fasteners, closures, and constructing garments to meet the mobility needs and to enhance the ease of dressing.



Figure 3: (i) Saree with stitched palla
(ii) Visual aesthetics of a pre-stitched saree



Figure 4: (i) Saree with stitched front pleats
(ii) Visual aesthetics of a pre-stitched saree

Delving deeper into the prototype development led to the realization that preparing an adaptive saree was complex. It was of meaningful significance when considering the length of fabric, complications in drapes, the layers of fabric to be wrapped around the body and the step of pleating. In order to reduce the complications and to simplify the wrapping of the garment fabric around the body different combinations of pre-stitching of the layers of the saree were created to investigate the outcomes. In each of these, some parts of the drape were pre-stitched. The initial prototypes were designed primarily by stitching several parts of the saree in a skirt like manner to test their effects on the reduction of the complex draping process. The unanswered question then remained about how the ends of the skirt (referred to as saree skirt in further text) could be held together, alongside the issue of waist adjustment, and whether it would be feasible to use fasteners to reduce the action of tucking the pleats in an underskirt.

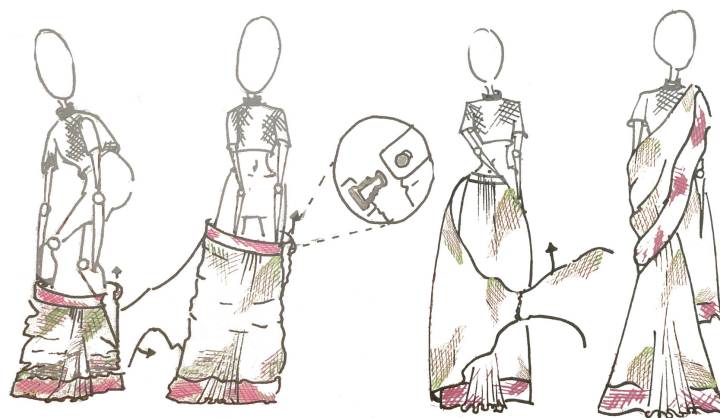


Figure 5: Belted skirt-style saree

One of the tested options was to stitch the pleats tucked into a belt at the top. The belt opened up on the side using dungaree buckle. The saree could be worn like a skirt, pulling up from the bottom over the knees, pulled to the waist and buckled together. The palla which is the loose end of the saree could be worn over the shoulder.

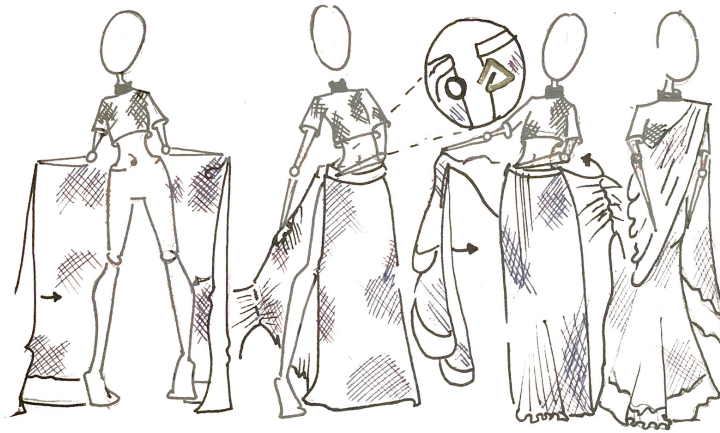


Figure 6: Wrap-around style saree with side overlap

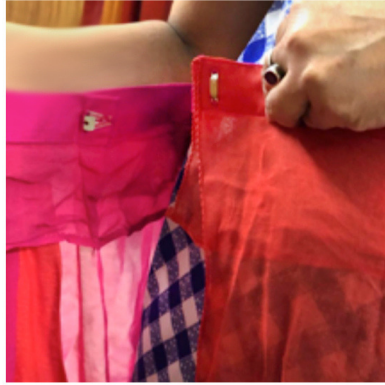
Another tested option was to pre-stitch the saree like a wrap-around skirt with side overlaps. A woman could easily hold the two ends of the overlaps, bring them together on a side and interlock them with the integral use of fasteners. The fasteners were stitched onto the garment for closure of the belt or the overlaps. With these adaptations, the need to wrap the garment around the body and tucking in of the pleats were avoided. This significantly enhanced the ease of donning and doffing of a saree.

In all, four prototypes were developed. These inclusive alternatives, generated using quick sewing construction and development methods with minimal resources, would be cost-effective solutions and easy to develop. A variety of fasteners were procured to be considered in these prototypes. Magnets, dungaree buckles, interlocking buckles, bent clip and ring, and eyelet and buckle were some of the fasteners used in different prototypes.

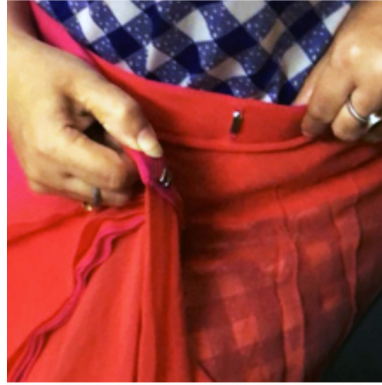
3.5.3 Concept Testing: Focussed Wear Test

The prototypes were tested by the selected sample group.

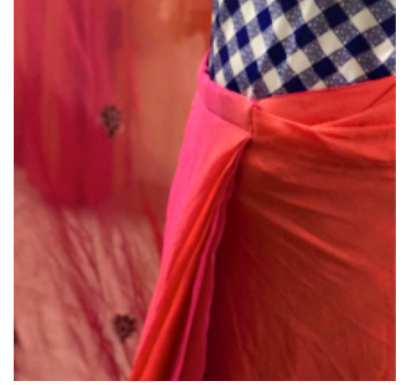
Wear tests involved having the participants trying on the garments to assess their response to the clothing problems as highlighted in the interviews conducted in the earlier phase. This related the prototype directly back to the participants' needs and preferences, while also highlighting the scope of recommended changes in the prototypes to enhance their responsiveness.



(i) Bring first panel of saree to the front



(ii) Overlap second panel and fasten the eyelet-buckle



(ii) Wind the loose end of saree around the body

Figure 7: Wear-test of a front overlap saree

In addition to the focussed wear test intended to investigate the responsiveness to the clothing and related barriers mentioned by the participants in the interviews, participant observation studies were simultaneously conducted. Observations were noted of the participants while they engaged with the new saree by being a part of the group. The purpose was to gain insights regarding the ease of wearability of the prototypes, while the participants wore the prototypes and performed a few specific directed activities like getting in and out of the garment, stretching and bending of body-parts, reaching out for objects, manoeuvring around using their assistive devices, if any, etc. The participants' feedback on the same was also sought. Some of the observations from the wear test revealed that the size and placement of the fasteners was of crucial significance. The smaller fasteners were difficult to operate whilst the larger ones were excessively visible, and that winding the extra fabric for palla around the body was troublesome for some women. It was also noticed that the front overlap and the belt style saree were easy to put on. The stitching of palla was observed to be more convenient because of the reduced action of pleating.



(i) Wear saree over the head and bring it down the torso



(ii) Bring it down to the waist and fasten the dungaree-buckle



(ii) Wind the loose end of saree around the body

Figure 8: Wear-test of a stitched belt saree

The focussed wear test by the participants validated the design explorations completed to date. These drew out both the potential iterations and changes to be incorporated. For example, the prototypes were developed using lightweight fabric, devoid of culturally popular intricate embroidery and so on, to ensure ease of wearing. In response to this, one of the common queries from the participants was about the ornamentation of the sarees – if embroidery and intricate borders could be possible, without adding a lot to the weight of the garment. Other crucial feedback was that the fasteners used in the garments must be revisited since those used in the prototypes were complicated to handle.

3.5.4 Prototyping of Fasteners

The focused wear test revealed that some of the fasteners, although procured after thorough market research did not provide the most apt solutions. It was particularly difficult for women with certain conditions of muscular dysfunctions to handle the fasteners that required more dexterity and fine motor coordination. Though disheartening at that point of time, and in hindsight, this gave rise to further explorations on how some readily available fasteners could be modified or made more appropriate for persons with disabilities.

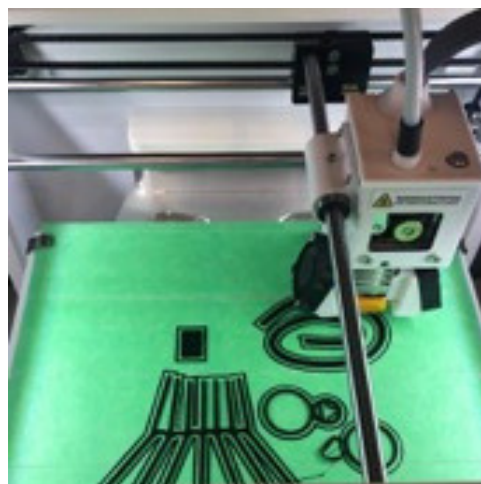


Figure 9: Fasteners getting printed
on a 3D printer

This led to an addition in the research process. Some viable options of fasteners were explored that could be used by women with limited movements in their hands and fingers. The most meaningful considerations throughout the research's creative and responsive development were the size of the fasteners and their placement on the garment for the comfort of use. The fasteners were envisioned to be attached to a semi/pre-stitched saree and to be tested by the participants of the research for their feedback and recommendations in a co-creation workshop.

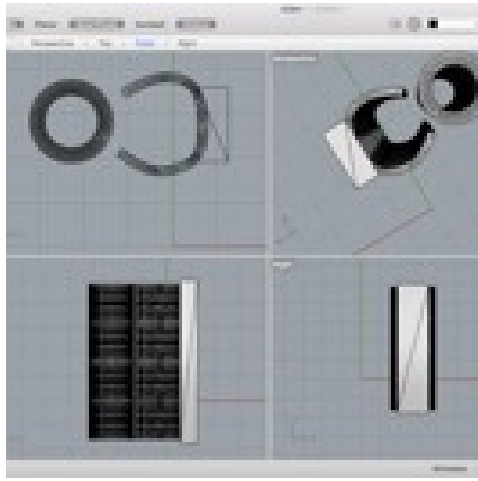


Figure 10: (i) 3D rendering of the slider



(ii) 3D printed fasteners

The technology of 3D drawing and printing was employed to develop feasible fasteners keeping in mind the participants movement limitations and to enhance their agency with these newly designed fasteners. The profiles of the fasteners were drawn using the Adobe Illustrator software which were next translated into 3D form with Rhinoceros (3D rendering) software. This software allowed to move around the fastener designs in perspective view, i.e. viewing the fasteners from a three planar view, which aided in viewing the rendered fasteners from all angles. This allowed for appropriate review of the designs of the fasteners, make required changes, and get images of the final outputs prior to printing the fasteners in a hassle-free and quick manner. Rapid prototypes of fasteners were then 3D printed and their usability tested.

FASTENER PROTOTYPE SPECIFICS

SPIRAL

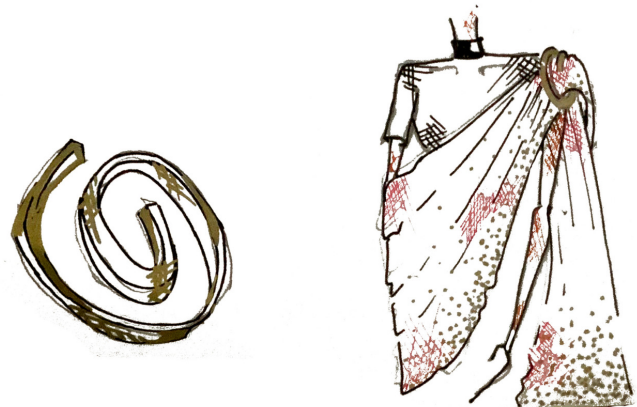


Figure 11: The Spiral fastener

The Spiral is a bent structure. It was developed for use in the saree prototypes in which the pleats were not stitched. This spiral could be wound around the palla fabric to form a 'gathered palla' without having to do the action of folding and pleating at the shoulder.

BENT CLIP + RING

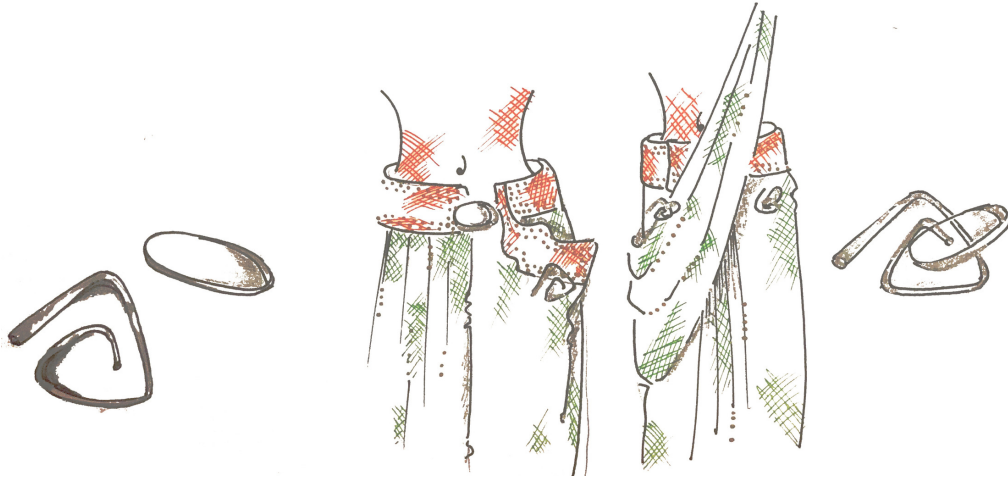


Figure 12: The Bent clip + ring fastener

The shape of a paper clip inspired the clip in this fastener. It was bent to an angle so that it could stick out of the fabric layer it is stitched upon, to allow room for the ring, attached to the other part of the saree skirt, to pass through.

BLOCK CLASP

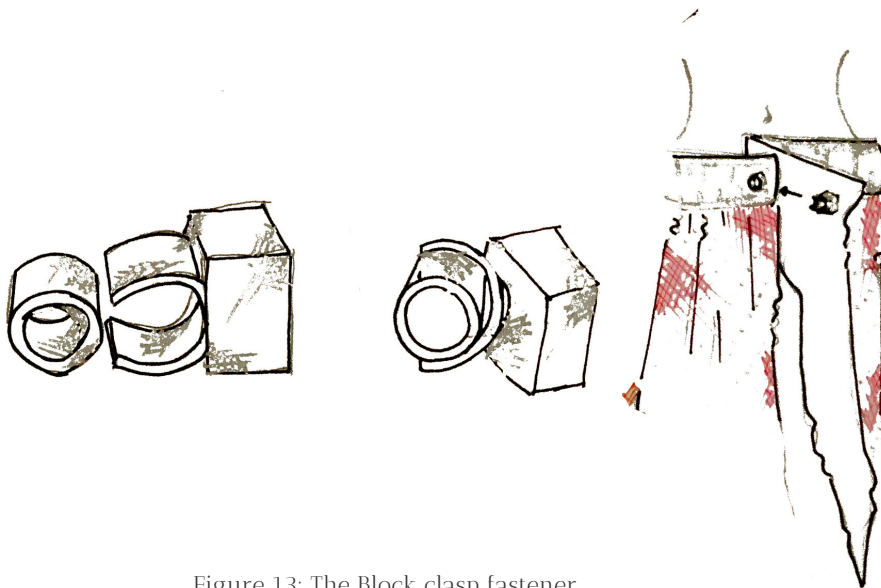


Figure 13: The Block clasp fastener

This fastener was developed as a small block with a U-shaped ring. It was attached to the overlapping part of the saree skirt, to be clasped onto a small tube-like structure attached to the underlapping part of the saree skirt.

SQUEEZE AND FIT

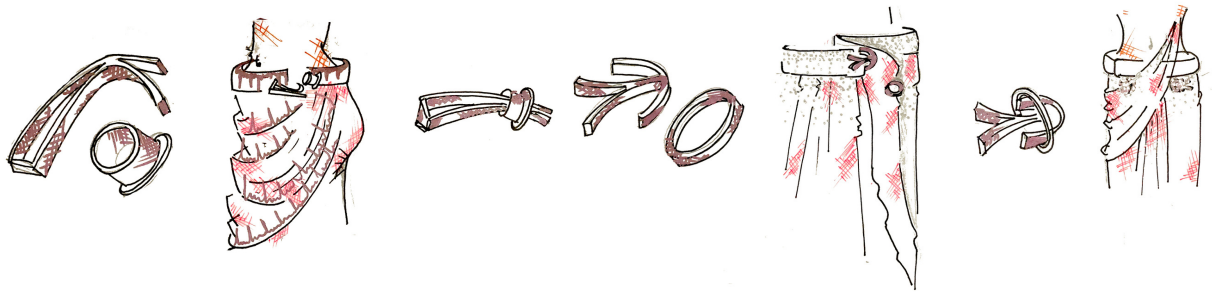


Figure 14: (i) The Squeeze and fit fastener

(ii) The arrow-style Squeeze and fit fastener

A fastener was created with two open edges which could be pinched together to pass through a small tube-like structure. This brought together the two sides of a saree skirt, based on the squeezing to pass through technique. An arrow-shaped fastener was also developed, the two ends of which could be pinched together and passed through a ring.

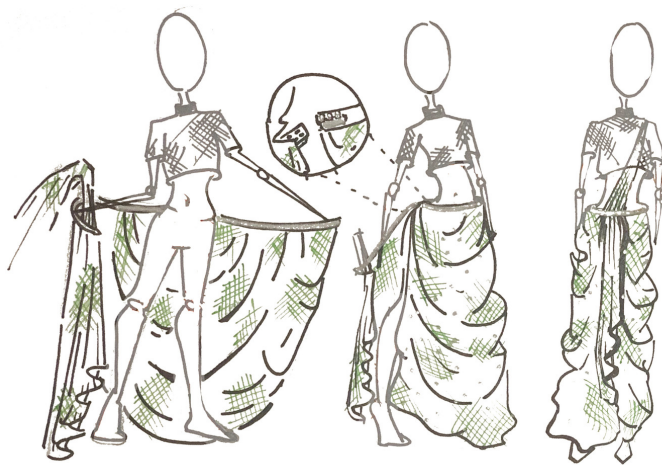
Another thought that emerged while working on the fasteners was that in the current form of the prototypes, it was necessary for the participants to use fasteners, which had a very reductionist approach. Since, there was no other workable alternative so far, which was as effective, it set the researcher to explore if the fasteners could possibly be embellished or made ornate, such that the participants could celebrate the use of these fasteners in their garments. As a result, along with enhancing the functionality of the saree, the fasteners would also add to its visual aesthetics, thus realizing the purpose of the present research.

3.5.5 CO-CREATION WORKSHOP

An arts-informed applied qualitative method was utilized to co-create the prototypes with the participants. The insights generated through focused-wear tests, such as the need for aesthetics in clothing, specifics of previously used closures, any unmet needs were drawn upon to develop personalized, inclusive clothing prototypes for four to five women from the identified sample.

The prototypes were co-created with the participants in order to address their unmet needs, based on their expert knowledge of their capabilities and limitations and the unique ways they have developed to cope with their disabilities with personal knowledge about their conditions that no books or desk research could provide. Not only did their insights deepen the researcher's understanding about the requirement

of inclusive clothing, but they also brought forth new ideas and constructive criticism of the work done so far, which enriched the process of garment creation. Hence, the participants' experiential expertise of their conditions was combined with the researcher's garment knowledge and construction skills to co-create possible design solutions.



A wrap-skirt style saree was created with front overlap considering the fact that the front of the garment was easier to reach. This saree could also be worn with ease by wheelchair users. The base of the saree would be spread on the wheelchair, then the participant would sit on this base, each side of the saree then brought in the front and interlocked with the fastener. After this, the palla is supposed to be wound around the body.

To further enhance the ease of wearing, a prototype was developed which, along with the pre-stitched pleats, had a palla pre-stitched into the belt. Thus the wearer, instead of winding the palla around, could simply take it from the side and drop it on the shoulder.

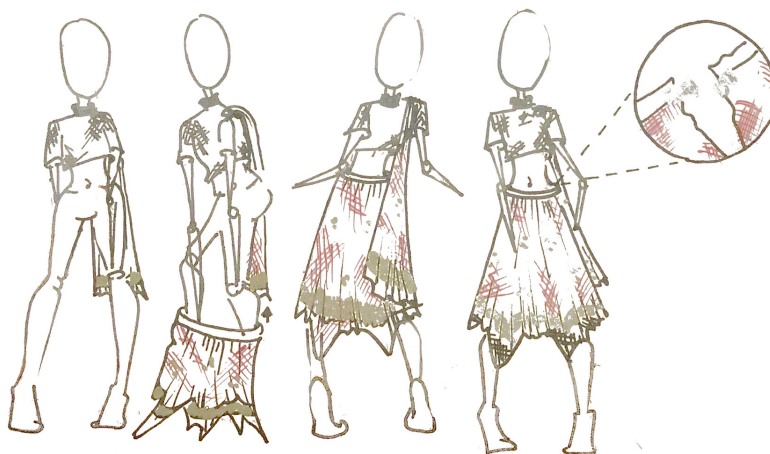


Figure 16: Handkerchief skirt with pleats + blouse with stitched palla

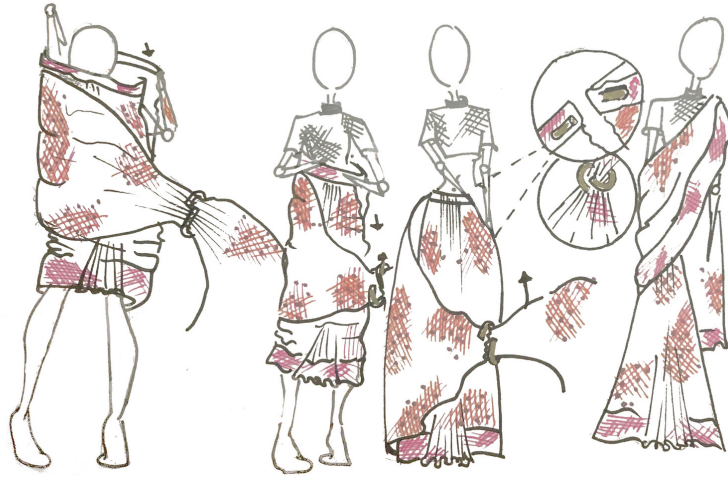


Figure 17: Belted skirt-style saree

Another tested option was the saree with pleats and the skirt stitched in a belt which opened up on the side. The saree could be worn like a skirt, sliding down the body over the head, brought down to the waist and put together. The palla could be worn over the shoulder.

A few fasteners were co-created with the participants.

SLIDER

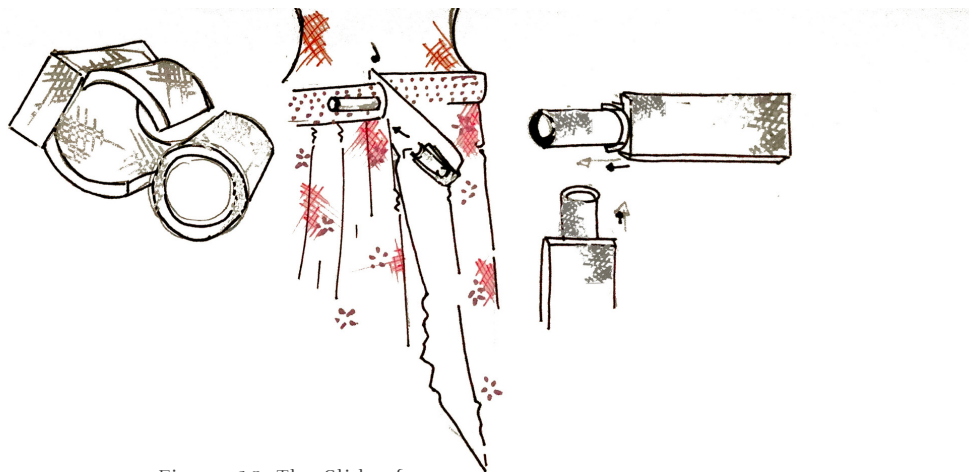


Figure 18: The Slider fastener

This fastener was developed as a long hollow U-shaped pipe which was to slide on the long tube. This fastener also provided the scope for some adjustment of the garment at the waist, depending upon how far could the U-shaped pipe slide into the long tube at the other end.

PEGS + HOLES

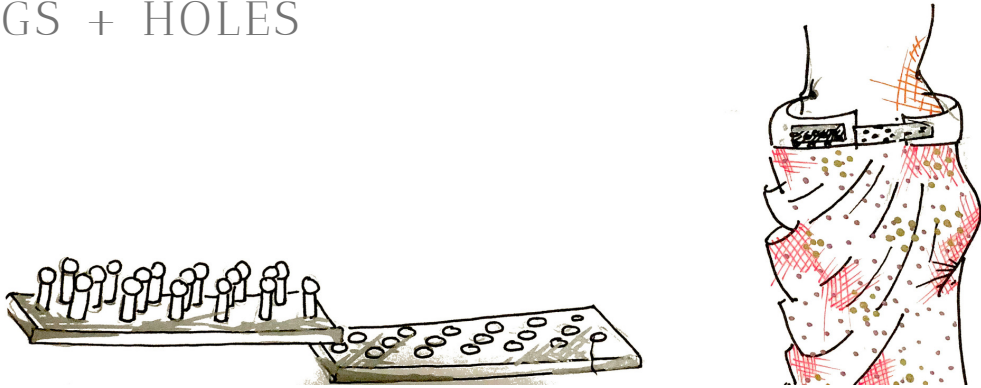


Figure 19: The Pegs + holes fastener

This fastener was inspired by the back closing of a cap. The base had some 'standing peg' like structures. This base was to be attached to the underlapping part of the saree skirt. A silicon strap with holes was to be overlapped onto the pegs. This strap was to be stitched to the overlapping part of the saree skirt. Since silicon is stretchable in nature, it provided a range for some adjustments at the waist.

These fasteners were then attached to the saree for a wear-test by the participants of the research to get their feedback and suggestions on their use.

EXTRA: PLEAT CLIP

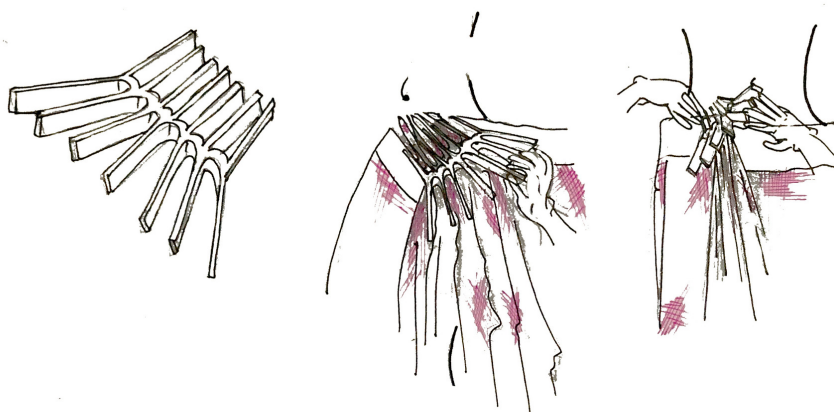


Figure 20: The Pleat clip

The Pleat clip was an additional tool, to be used in prototypes in which pleats were not pre-stitched. This clip, with tooth-like structure allowed space to fit folds of fabric between two teeth, a collection of which helped in easy forming of pleats.



The prototypes thus developed were high on functionality and responded to the specific needs of the participants to improve the ease of dressing and undressing whilst promoting their sense of dignity and independence. To fit to a greater range of disabilities, some base modifications were adjusted to the garment, with additional options that remained an individual choice, such as the type of fasteners used, the stitching of palls, the type and range of disability dependant. After trying these fasteners, the participants shared that their anxieties related to clothes and the emotional stress of dressing and undressing were reduced. They expressed that the use of these fasteners would enable them to enjoy the experience of dressing instead of agonizing over it. Additionally, participant involvement as active contributors in the design development and prototyping process ignited confidence and sense of agency in them.

In addition, following the principles of participatory design yielded constant validity to the developed prototypes and confirmed their suitability and utility, particularly throughout the process of designing and developing user-centric garments.

3.5.6 CONCEPT TESTING: WEAR TEST

Following the insights gained from the previous wear test and the co-creation workshop, the prototypes developed were tried on by the selected sample group. Wear testing involved having the participants try on the garments. This related the prototype directly back to the user needs and preferences, and helped to determine whether each woman's specifications were satisfied by the prototypes that they wore. Some experiments of observation trails of the garment were performed. The participants were expected to wear the garment for longer periods of time and to perform their usual daily activities in their typical settings, to see how their movements affect the use of the garment and analyze how well the garment worked out for complete use, following the grounds of naturalistic observation trials.



04

DATA COLLECTION
& ANALYSIS

4.1 --- NEED ASSESSMENT

A deep understanding was gained about the disabilities covered in the scope of this project, and resulting challenges, from interviewing the participants and experts in the field. Discussion with the Executive Director of Samarthyam, who herself is a woman with disability, was a very enriching experience. She is a person who faces the challenges that come with the disability. This, coupled with her technical knowledge and ability to enhance accessibility gave the researcher substantial insights from her personal, professional and technical perspectives.

4.1.1 Challenges Faced by Women with Physical Disabilities

The qualitative data shows that within one type of disability itself (physical disability in case of the present study), there was a huge diversity in the challenges faced by the women. For instance, women with cerebral palsy mentioned that their major challenges included loss of control on their muscles; muscle stiffness; poor coordination and reflexes; imbalanced posture; shaky movements and dependance on mobility devices in moderate range, among others. The challenges faced by women with reduced dexterity included lessened coordination of fingers; difficulty in bending fingers; difficulty in handling small things; loss of grip; and reduced sensations. Women with arm amputations noted that they find it difficult to reach far parts of their bodies; reaching for and holding things; and had more variations in body measurements. Women with amputated legs depended on mobility device and had wider-ranging disproportionate body movements. Analysis of the results showed that major problem areas for the participants were limited muscular movements, bending of fingers, bending and reaching ends of the body, variations in body measurements and limited mobility, which was considered while designing and developing the prototypes. This variation in the challenges faced by women with physical disabilities reveals that there can not be a 'one-size-fits-all' solution that will respond to these diverse needs.

4.1.2 Criteria for Selection of Clothing

Comfort and fit are the foremost considerations for choosing a garment due to the importance of the functionality of the garment. If a garment does not meet this requirement, it defies the fundamental purpose of any garment. Nonetheless, design details such as patterns, textures, and visual aesthetics of a garment are also significant and decisive factors in clothing choices. Data from the present study corroborates this in case of women with disabilities. They exhibited a preference for patterns, ornamentations and colour to be emphasized in the garments developed for them. The weight of the fabric also affects the use, donning and doffing of a saree. For women with physical disabilities, lightweight fabric is one of the important factors considered in the selection of clothing, so that the garment could be managed easily.

4.1.3 Suitability of Ready-to-Wear Clothing

Data from the present research tells that quite often, due to their differently proportioned body sizes, women with physical disabilities face difficulty in finding ready-to-wear garments that fit them well. Contemporary clothing picked up by the participants at stores often required them to replace the fasteners used in the garments. One participant said:

"I have problems with zippers and sometimes buttons. I usually buy clothes that either don't have zippers or buttons or they aren't required to be used. I find elastics, velcro, snap buttons and hooks easier. But using velcros or snap buttons makes me feel like I am dressing like a child and also reduces the quality of my garments. Sometimes the elastics used are also not suitable and hurt on the waist since I am in a sitting position throughout the day. Only the thick broad elastics, like those used in sportswear are comfortable."

Clothing had to be often altered to make it fit. Some women got their clothes modified or altered with the help of their friends and family, others regularly spent money on getting each clothing item altered. Some of them spent huge sums on getting garments stitched according to their preferences.

"My friend usually does alterations, so it doesn't cost me anything. But I have to depend on her each time. She usually has to hem my pants and adjust sleeves and/or necklines. You know, I sit in a wheelchair. Even if the neckline of a garment is a little low, I am exposed to anybody who is standing near me. So, I have to get the necklines of my clothes modified."

"I get my garments for special occasions stitched by using industry designed clothing as samples. They are made specifically according to my requirements. It involves a lot of effort and sometimes even a lot of money."

It was also noticed that in spite of their keenness to wear garments that speak to their style, the participants were usually unable to use ready-to-wear garments that appeal to them since they are unsuitable for a variety of reasons:

"Yes, there are gaps, stuff rarely fits me due to my disproportionate size, hence it is very difficult to find suitable clothing. For example, I'd love to wear long dresses, but they are not designed for someone sitting on a wheelchair, they are too long."

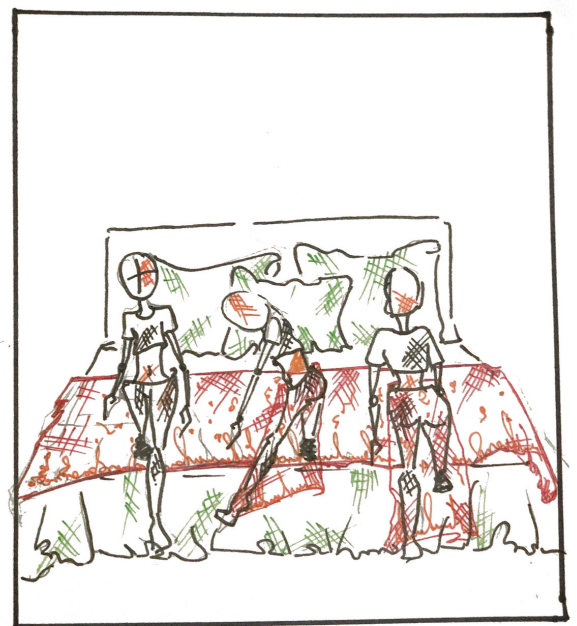
"When I head out to buy jackets, either they are heavy or fluffy."

"I go for outings every other weekend but it's hard to find dresses that fit me well."

Most of the women stated that they often went out to attend occasions, events, gatherings and outings. Some of them reported heading out two to three times a week. However, they felt a huge void in terms of well-designed clothing, which is functional as well. This compelled most of the women to choose garments largely from the specially-designed clothing only. While some others did chose to buy clothing off the rack, a number of women had to make them usable.

From the research it was noted that women had a keen interest in wearing the saree, this being the common customary dress. They expressed the desire to wear it, especially during occasions. To do so, some of them depended on others or did difficult actions. It was also mentioned that when participating in cultural functions, because of their dressing styles and inability to wear a saree, they sometimes either feel left out, or incapable. Sometimes they even avoid visiting such gatherings due to the lack of suitable clothing.

"Due to the cultural implications, I have worn saree a couple of times. I live with my husband and do not have any other member in the house who could help me in wearing a saree. I had to wear the saree myself. I laid the saree on my bed and rolled my way into it. It was a very tedious task and also did not do justice to its elegance because the drape was a little shabby."



"I'd love to wear a saree but it's difficult to drape and carry the meters of fabric while sitting. I want to dress to feel and look good. Although I love sarees, I know I won't do justice to it so I don't try to wear it. I wear long tight dresses with a blouse. Even long dupatta is hard to manage."

"I think sarees are pretty but not very practical for persons with disabilities. They are difficult to get on and off. I don't think I could wear a saree."

Gathering data from the sample group provided a deep understanding of the clothing needs—functional and aesthetic of this target group. Information from this was used to develop products that would prove successful in enhancing their ability and, in turn, improving their sense of well-being. For the identified sample, self-efficacy seemed to have a substantial impact on their clothing choices. The most profound learning was that barriers faced by persons with disabilities were not so much because of their impairments, but because of the way we design garments things and spaces.

4.2 WEAR TEST

The idea of an adaptive saree led to a lot of excitement in the target group, especially because of its cultural implications. They showed keen interest in the idea of an inclusive saree and were enthused that they would be able to wear the garment with ease and enjoy its elegance. There was a lot of positive energy while trying the prototypes. The sarees were easy to drape due to the stitched pleats and palla. Women did not have to bother to maintain it in its position for a long time during the process of wearing. Hence, the entire process of putting on the saree only took a couple of minutes.

For the subsequent co-creation workshop, some fasteners like magnets, coat loop/hooks and dungaree buckles were stitched onto the previously tested sarees. Evidence from the wear test of the prototypes shows that some of the fasteners, which were procured with an assumption that they would ease the closures of overlaps, did not prove most effective. Due to the movements of the body the magnets kept coming off. Because of its size and boldness, the dungaree buckle stuck out and was very striking. This use of standard fasteners helped gather a lot of

insights on feasible options from the commercially available fasteners; as well as modification of fasteners required for easier use. The experience inspired the development of a set of new fasteners and construction details that would benefit the use of the developed garment.



Figure 21: Fastening the saree belt using the butterfly clip



In the final wear test, the sarees with front overlap and saree skirt with belt which could be worn from over the head received a very positive response. These options did not necessitate the use of an underskirt anymore. Among the developed fasteners the Bent clip + ring, the Slider and the Pegs + holes received the most positive feedback. Due to the size of the ring, shape of the clip, and rigid material, the fastener did not require a lot of bending of fingers and also provided great support. The slider due to its length was convenient for use and could also provide minor waist adjustments. The prototype with pegs and silicon, due to its elastic nature provided more adjustability to the garment. Further, because of their numbers, the holes and pegs could easily grasp onto each other, thus enhancing the ease of closing. Though the pleats of the palla were pre-stitched, there were huge benefits of the spiral which could be used to form pleats by rotating, if the palla wasn't pre-stitched.

These sarees gave the participants a feeling of empowerment with regard to wearing a garment, which thus far, they generally were not able to wear at all or depended on others to wear.

4.3 OUTCOMES

The process of this research was a continuous cycle of brainstorming, developing prototypes, concept testing, followed by a prototyping workshop and another wear test, not following a linear path. This research adhered to the criteria consistent with fundamental principles of low energy and low material intensity, and high regenerative potential and the guiding principles of enabling solutions and enabling people to live as they like.

The outcomes gained would lead to purposeful change while attempting to shed old paradigms of adaptive clothing being limited only to ease of functionality, and rather enhance the individual treatment of people with disabilities with respect and admiration. The results of this study informed the development of aesthetically designed accessible garments with focus on functionality and inclusivity. The garments designed with a cultural connection, celebrated the heritage of fashion and design in India. At the same time, they promoted a sense of well-being and dignity in women with disabilities by eliminating the problems they faced in wearing sarees. Most importantly, the garment prototypes developed in this project directly benefited most of the participants.

The research whilst being an advocate for inclusivity in society, underscores the fact that things and spaces should be designed following a human-centric approach opposed to just being design-centric. This entails paying primary attention to people and being responsive to the emotions they experience while using the product instead of the fixing the spotlight on the features of the products.

Personal outcomes include improved knowledge of disabilities, attitudes of people with disabilities and the society surrounding them. The research also strengthened the abilities to analyze, think creatively, and an inclination towards user-centric inclusive design practice.



05

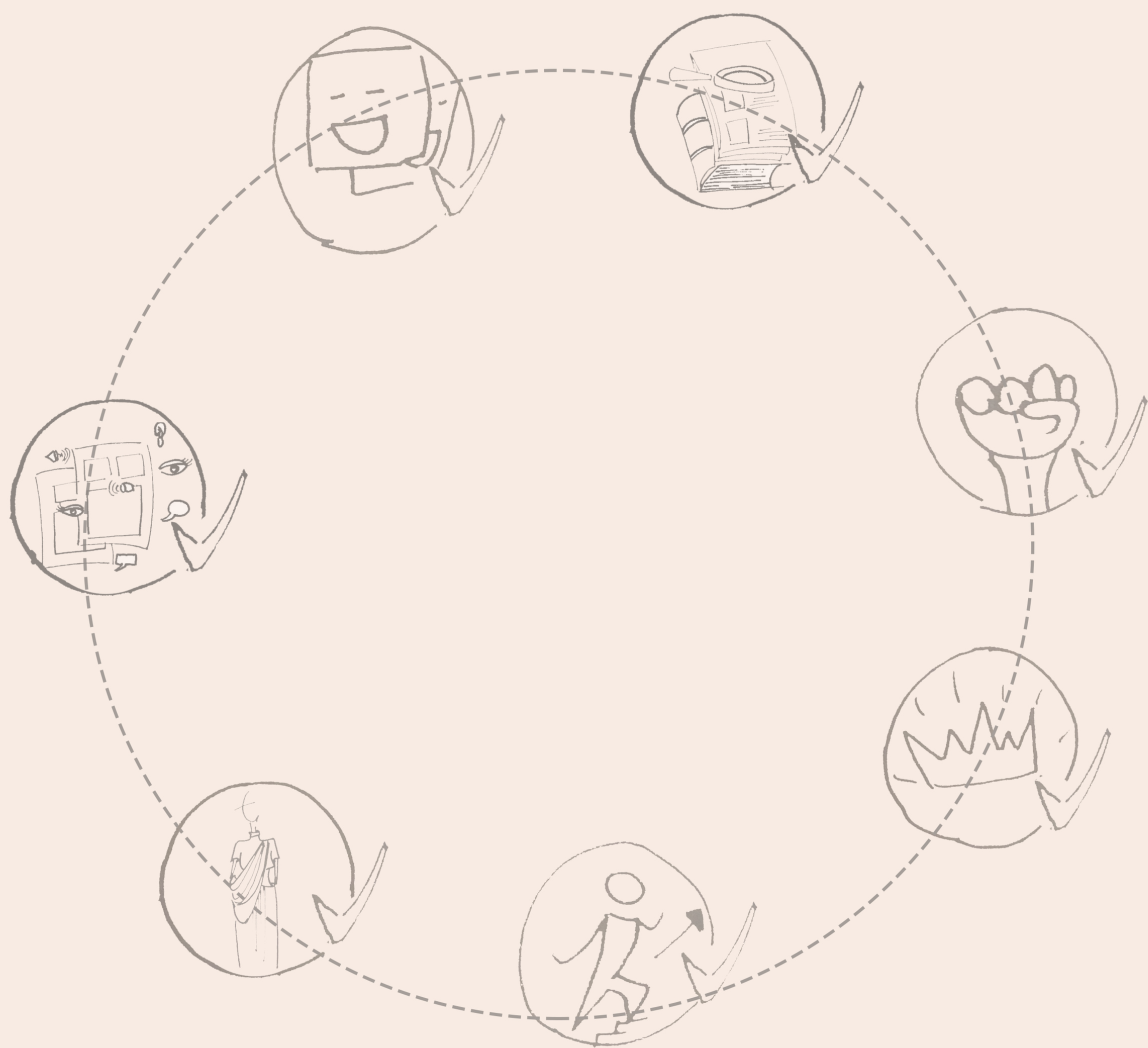
FUTURE DIRECTION

Considering that this study is limited to a small sample of adult women with physical disabilities, the propositions cannot be generalized. Further research with a broader range of participants of different disabilities and a larger sample would increase the outcome of making the concept of functional and contemporary clothing better suited for a larger array of population. Looking to expand the current outcomes and realizations in this project, future research could continue to employ organic models of design that engage diverse perspectives with the purpose of building bridges across differences -- age, gender and disabilities -- thus making them available to larger groups and reducing the societal fragmentations due to the manner in which products are designed.

The principle contribution for the design field is that the progressive realization of inclusive design is not beyond reality, and contrary to common belief, does not entail exorbitant cost implications either. Transforming design practices as rights-based decision and not as charity is critical to enable persons with disabilities to become an integral part of the society.

It would be also useful to expand this study for a deeper understanding of aesthetic aspects such as colour, design details and fabric feel as well as functional aspects such as fabric comfort and garment silhouette.

Further investigation may be necessary to probe the possibility of making contemporary functional clothing available at scale.



06

CONCLUSION

Clothing is a significant need for all humans. It is a form of protection, a provision of comfort, a means of self-expression, adornment and enhances self-esteem and confidence. For persons with disabilities clothing requirements are compounded due to their diverse needs.

The research Inclusive Design for Regaining Lost Identity conversely revealed that existent design practices are not responsive to diversity. The available clothing choices for persons with disabilities currently do not intuitively provide for the above-mentioned psycho-social, emotive and expressive qualities of apparel. Largely, they do not receive due attention as potential customers. The way clothing is designed offers them very limited buying options, which contributes to their exclusion. Clothes, if at all developed specifically for persons with disabilities, may meet their functional needs yet are rarely designed with consideration to visual and cultural aesthetics. Yet in a nascent stage, there are nominal exemplary pieces of work that focus on design-led contemporary functional clothing.

It is critical to enable persons with disabilities and to renounce the existing prejudicial exclusionary practices and any beliefs of incompetence to become an integral part of the society and all aspects of it, including clothing. This necessitates acknowledging the differences in people and their discrete specificities and to respond to them with a broader horizon. It is important to promote their pride and ownership in their disability status. To actualize this, and impress upon the society and the persons with disabilities that what they wear matters, the process of design should be based on the analysis of specific and distinct user needs and desires, focusing less on their differences and inabilities and more on responding to their unique needs such that all access is equal.



The incredible stories and experiences shared by the participants in this research highlighted the fact that persons with disabilities wanted to feel, dress and look how they wanted to look by wearing what they wanted to wear. Clothing should be about self-expression – reflecting their moods, taste and style and not limited to fulfilling merely their functional needs. The prototypes developed in this research demonstrate that aesthetically designed inclusive clothing for women with disabilities increased their personal agency and control on donning and doffing, encouraged them to take greater responsibility of their own lives and empowered them to assert their choices. The newfound empowerment symbolizes and helps promote positive life experiences. The developed saree choices within this research can have a powerful impact on the satisfaction in the lives of women with disabilities, fostering an immense feeling of independence and belonging rather than experiencing a wall of inferiority.

A constant involvement of participants in all stages of the design process so they can benefit from it and be the agency of inclusion. The feedback elicited from the participants during the wear tests revealed that these sarees are a step in the direction of addressing some of the critical issues in empowering women with disabilities towards autonomous living. Inclusive designs strive to fundamentally evolve products beyond their conventional definitions, by changing the defining standards for products, such that barriers do not exist in the first place.

Inclusive design practices that accept and respond to diversity promote inclusion of all. If adequate attention is paid to adopt inclusive design practices and the principles of equity that respond to the aspirations of persons with disabilities and respective needs to dress in a contemporary aesthetic, it can foster the assertion of their self, leading to their empowerment. An overarching positive outgrowth from the research could be the concept of inclusive design that is applied in all fields of design and design research to enhance its social sustainability by encouraging full participation and improved user satisfaction, thereby benefitting a much broader range of people and hence being inclusive. Such inclusive designs will not begin with predetermined notions of 'endpoints and success criteria of designs', but will aim at flexibility and innovation in design processes to enhance usability and responsiveness.

What the research hopes for in the long-term are communities where people are not isolated and segregated; where everybody belongs and has a voice. Such social systems would be designed to respect and include diversity and human variability, and for people with the full range of human differences to participate and contribute to their fullest.

"To tell you the truth, engaging with you in the development of these sarees has struck great optimism in me. It has raised hopes in me about what all can be possible. It has triggered a sense of being comfortable with my body, which was not the case so far."





07

BIBLIOGRAPHY

Antonela, C., Viorica C., Laura M., Marian, P. (2014). Designing Functional Clothes for Persons with Locomotor Disabilities. *AUTEX Research Journal*, 14 (4), pp. 281–289.

Bailey Stokes & Catherine Black (2012) Application of the Functional, Expressive and Aesthetic Consumer Needs Model: assessing the clothing needs of adolescent girls with disabilities, *International Journal of Fashion Design, Technology and Education*, 5:3, pp. 179–186, DOI: 10.1080/17543266.2012.700735

Carroll, K. E., & Kincade, D. H. (2007). Inclusive design in apparel product development for working women with physical disabilities. *Family and Consumer Sciences Research Journal*, 35(4), pp.289–315.

Carroll, K., & Gross, K. (2010). An examination of clothing issues and physical limitations in the product development process. *Family and Consumer Sciences Research Journal*, 39(1), pp. 2–17.

Chang, H., Hodges, N., & Yurchisin, J. (2013). Consumers With Disabilities. *Clothing And Textiles Research Journal*, 32(1), pp. 34–48. doi: 10.1177/0887302x13513325

Chang, H., Yurchisin, J., Hodges, N., Watchravesringkan, K., & Ackerman, T. (2013). An Investigation of Self-Concept, Clothing Selection Motivation, and Life Satisfaction among Disabled Consumers. *Family And Consumer Sciences Research Journal*, 42(2), pp. 162–176. doi: 10.1111/fcsr.12050

Connell, B. R., Jones, M., Mace, R., Mueller, J., Mullick, A., Ostroff, E., Sanford, J., Steinfeld, E., Story, M., & Vanderheiden, G. (1997). *The principles of universal design*.

Dilnot, C. (2009). Ethics in Design: 10 Questions. In Clark, H. & Brody, D. (Eds.), *Design Studies: A Reader*. pp. 180–190. Oxford: Berg.

Dlf.org.uk. (2019). Choosing clothing and dressing equipment | Disabled Living Foundation. [online] Available at: <https://www.dlf.org.uk/factsheets/clothing> [Accessed 15 Mar. 2019].

Esmail, A., Poncet, F., Rochette, A., Auger, C., Billebaud, C., & de Guise, É. et al. (2018). The role of clothing in participation of persons with a physical disability: a scoping review protocol. *BMJ Open*, 8(3), e020299. doi: 10.1136/bmjopen-2017-020299

Finkelstein, V. (1980). Attitudes and disabled people: Issues for discussion (No. 5). World Rehabilitation Fund, Inc.

Francis, L. P., & Silvers, A. (2000). Achieving the right to live in the world: Americans with disabilities and the civil rights tradition. *Americans with Disabilities: exploring implications of the law for individuals and institutions*.

Goering, S. (2015). Rethinking disability: the social model of disability and chronic disease. *Current Reviews in Musculoskeletal Medicine*, 8(2), pp. 134–138.

Ha-Brookshire, J. (2015). Global sourcing: new research and education agendas for apparel design and merchandising. *Fashion and Textiles*, 2(1), p.15.

Haug, A., & Busch, J. (2016). Towards an ethical fashion framework. *Fashion Theory*, 20(3), pp. 317–339.

Hoskins, T. (2017). Fashion industry is letting down people with disabilities – to its cost. *the Guardian*. Retrieved 4 December 2017, from <https://www.theguardian.com/sustainable-business/sustainable-fashion-blog/fashion-industry-letting-down-disabled-disability-cost-beauty> Issues 8, no.2. pp. 14–19.

- Kabel, A. (2016). Disability, the Senses and Apparel: Design Considerations. *The Senses and Society*, 11(2), pp. 206–210.
- Kabel, A., Dimka, J., & McBee-Black, K. (2016). Clothing-related barriers experienced by people with mobility disabilities and impairments. *Applied Ergonomics*, 59, pp. 165–169. doi: 10.1016/j.apergo.2016.08.036
- Kidd, L.K. (2006). A Case Study: Creating Special Occasion Garments for Young Women with Special Needs. *Clothing and Textile Research Journal*, 24(2), pp. 161–172.
- Klepp, I. and Rysst, M. (2016). Deviant Bodies and Suitable Clothes. *Fashion Theory*, 21(1), pp. 79–99.
- Klerk Helena M. de and Ampousah Lucy. (2002). The physically disabled South African female consumer's problems in purchasing clothing. *International Journal of Consumer Studies*, 26 (2), pp. 93–101.
- Lamb Jane M. and Kallal M. Jo. (1992). Conceptual Framework for Apparel Design. *Clothing and Textiles Research Journal*, 10 (2), pp. 42–47.
- Lamb, J. M. (2001). Disability and the Social Importance of Appearance. *Clothing and Textiles Research Journal*, 19(3), pp. 134–143.
- Langdon, P., Clarkson, J., & Robinson, P. (2008). Designing Inclusive Futures Management : An international journal, 10(3), pp. 360–371
- Martins, S., & Martins, L. (2012). *Ergonomics, design universal and fashion*. pp 4733 – 4738. IOS Press. Amsterdam.
- Manzini, E. (2006). Design, ethics and sustainability: guidelines for a transition phase. *Design*
- Oliver, M. (1990, July). The individual and social models of disability. In Joint workshop of the living options Group and the Research Unit of the Royal College of Physicians (Vol. 23).
- Park, J., Morris, K., Stannard, C., & Hamilton, W. (2014). Design for Many, Design for Me: Universal Design for Apparel Products. *The Design Journal*, 17(2), pp. 267–290. doi: 10.2752/175630614x13915240576103
- Persson, H., Åhman, H., Yngling, A., & Gulliksen, J. (2014). Universal design, inclusive design, accessible design, design for all: different concepts—one goal? On the concept of accessibility—historical, methodological and philosophical aspects. *Universal Access In The Information Society*, 14(4), pp. 505–526. doi: 10.1007/s10209-014-0358-z
- Pfeiffer, D. (2001). The conceptualization of disability. In *Exploring theories and expanding methodologies: Where we are and where we need to go*. pp. 29–52. Emerald Group Publishing Limited.
- Pullin, G. (2009). *Design meets disability*. The MIT Press.
- Reich, N., & Shannon, E. (1980). Handicap: Common Physical Limitations and Clothing-Related Needs. *Family and Consumer Sciences Research Journal*, 8(6), pp. 437–444a
- Rutledge, B. (2017). Auto-ethnographic Study in the Process of Applied Design: Creating Adaptive Clothing for a Child with Spinal Muscular Atrophy.
- Shearer, A. W. (2015). Abduction to Argument: A Framework of Design Thinking. *Landscape Journal: design, planning, and management of the land* 34(2), 127–138.

Smith, K. (2013). Exploring Adaptive Clothing Needs for Hemodialysis Patients (Doctoral dissertation).

Stokes, B., & Black, C. (2012). Application of the functional, expressive and aesthetic consumer needs model: Assessing the clothing needs of adolescent girls with disabilities. *International Journal of Fashion Design, Technology and Education*, 5(3), 179–186.

Sustainable Development Goals (SDGs) and Disability | United Nations Enable. (2019). Retrieved from <https://www.un.org/development/desa/disabilities/about-us/sustainable-development-goals-sdgs-and-disability.html>

UNICEF. (2019). Introduction. [online] Available at: <https://www.unicef.org/policyanalysis/rights/>

Wang, Y., Wu, D., Zhao, M., & Li, J. (2014). Evaluation on an ergonomic design of functional clothing for wheelchair users. *Applied Ergonomics*, 45(3), 550–555. doi: 10.1016/j.apergo.2013.07.010

Wingate, S., Kaiser, S., & Freeman, C. (1986). Salience of Disability Cues in Functional Clothing: A Multidimensional Approach. *Clothing And Textiles Research Journal*, 4(2), 37–47. doi: 10.1177/0887302x8600400206

Wright, A. (1973). Occupational differentials in chronic disability. *Journal of Occupational and Environmental Medicine*, 15(6), 493–498.

Zarb, G. (1991). *Women and Disability: The Experience of Physical Disability Among Women* Susan Lonsdale Macmillan, London, 1990, 186pp, £30.00 hbk, £8.99 pbk. *Critical Social Policy*, 11(33), 116–120. doi: 10.1177/026101839101103310

Zitzelsberger *, H. (2005). (In)visibility: accounts of embodiment of women with physical disabilities and differences. *Disability & Society*, 20(4), 389–403. doi: 10.1080/09687590500086492



08

APPENDICIES

QUESTIONNAIRE

**Title of the study: Inclusive design for regaining lost identity:
Accessible, Aesthetic and Effortless clothing**

Principal Investigator: Maxe Fisher
Emily Carr university of Art + Design

Other Researcher/s: Sukriti Tandon
Emily Carr university of Art + Design

This project proposes to design and develop accessible and fashionable clothing that is both inclusive and appealing. The design research aims to promote inclusiveness alongside with the potential to foster the psycho-social well-being and enhance self esteem of women with disabilities. This research is intended to gather preferred requirements of clothing in order to then develop, design and produce prototypes of accessible garments in a participatory manner; co-creating the designs with the participants throughout the research. Designing functional, yet contemporary garments for social occasions will also be explored. This research would potentially promote inclusive design practices.

This study requires participation of WOMEN in the age group of TWENTY TO FORTY YEARS.

- This questionnaire will take about 30-40 minutes of your time.
- Your participation in this study is voluntary.
- You may choose to answer as many questions as you wish.
- You may decide to withdraw anytime, should you decide not to be a part of the research.
- There will be no negative consequences if you choose to withdraw from the research.
- The information collected for this study will be strictly confidential and will be used only for the present research. Any information that could possibly identify you will not be mentioned in the report.
- The information that you provide will be summarised in an anonymous format.
- Raw data collected in this survey will be kept in a secure storage. After discussion with my supervisor at school and the completion of the research, it will be destroyed using a shredder.

Consent

I have read the above stated information. I understand that my responses will remain anonymous and that my identity will not be disclosed.

I give my consent to participate in this study. I am above 18 years of age, and am legally able to provide consent.

Participant's signature_____

Date:_____

Age

:

Type of

Disability :

Occupation

(if any)

:

Where do you usually shop and buy your clothing? Do you need to go to a specific place to buy clothes?

How often do you head out for occasions and work?

Are there any difficulties you face when buying clothing?

Do you feel there is a gap in the market in relation to comfortable fashion

Do you find the clothing you buy practical AND fashionable?

Rate comfort/aesthetics/practicality/affordability/availability, in an order, as the criteria for selection of clothing.

**When looking for clothing what attracts you to a particular garment?
Is it the colour; pattern or the material?**

**Are there any specific changes/alterations that you make to the
clothes you buy?**

How much money do you spend on all these alterations?

Do you feel comfortable in the clothing you buy and alter?

**Do the clothes you buy and/or alter give you the freedom to be
independent?**

**Do you think some people struggle with fasteners (e.g. zips; buttons;
strings) commonly used in clothing?**

**Would you like to suggest any particular fasteners that could be used
in your clothing?**

**I am very keen to learn more from you. This research also requires
participants to try on a few built prototypes. Please contact me at
778-929-7005 or sukrititandon01@gmail.com, if you would further
like to participate in my research**

Thank you for the effort put in to fill this questionnaire. Your inputs are extremely valuable for my research project.

If you have any questions or concerns about this study or if any problems arise, please contact Sukriti Tandon/Maxe Fisher at Emily Carr University of Art+Design at standone@ecuad.ca / maxefisher@ecuad.ca or 778-929-7005.

LIST OF FIGURES

Figure 01	Step-to-step on how to drape an unstitched, unaltered, traditional saree
Figure 02	In-depth need assessment and analysis
Figure 03	Saree with stitched palla and its visual aesthetics
Figure 04	Saree with stitched pleats and its visual aesthetics
Figure 05	Belted skirt-style saree
Figure 06	Wrap-around style saree with side overlap
Figure 07	Wear-test of a front overlap saree
Figure 08	Wear-test of a stitched belt saree
Figure 09	Fasteners getting printed on a 3D printer
Figure 10	3D rendering of the slider and 3D printed fasteners
Figure 11	The Spiral fastener
Figure 12	The Bent clip + ring fastener
Figure 13	The Block clasp fastener
Figure 14	The Squeeze and fit fastener
Figure 15	Wrap-style saree with front overlap
Figure 16	Handkerchief skirt with pleats + blouse with stitched palla
Figure 17	Belted skirt-style saree
Figure 18	The Slider fastener
Figure 19	The Pegs + holes fastener
Figure 20	The Pleat clip
Figure 21	Fastening the saree belt using the butterfly clip

"The disability is not the problem, the
accessibility is the problem"

(Mohamed jemni : TED 2013)

