ERGONOMICALLY DESIGNED ADAPTIVE SARI FOR AN ELDERLY WOMAN

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Abstract: *The sari is a traditional garment cherished for its elegance and cultural significance in South Asia. The process of sari draping involves several repetitive movements, such as pleating, tucking, and securing the pallu (loose end), which can strain muscles and joints, particularly in the shoulders, back, and hands for people with disabilities and elderly with arthritis or reduced mobility. By integrating ergonomic principles into sari design and draping techniques, designers and practitioners can mitigate physical strain and enhance ease of use. This includes considerations of various factors like fabric selection, garment weight distribution, and the incorporation of adaptive features like magnetic closures or pre-stitched pleats. Adaptive clothing plays a crucial role in improving the quality of life for individuals facing physical disabilities, cognitive impairments, or age-related challenges. The primary objective of adaptive clothing is to enhance comfort, promote independence, and facilitate daily activities that conventional clothing may delay. This paper explores the application of ergonomics principles to sari draping, aiming to improve comfort, efficiency, and accessibility for elderly woman with physical limitations and developing new sari design. The study is focused on one individual client since adaptive sari is purely customized product. The category chosen for design development was evening wear for her grand daughter's wedding. The client's measurements, problems faced, requirements were noted and adaptive sari with blouse were designed and developed for the selected client. Feedback of the developed adaptive sari was obtained and recorded. A time study and the degree of difficulty in dressing were also conducted to know about the dressing time and the client found these developed adaptive clothing was very effective and helpful.*

Keywords: Adaptive Clothing, Elderly woman, Ergonomics, Functional Clothing and Sari.

1. INTRODUCTION

Clothing is one of the basic needs of human-kind. The need for clothing depends on various factors such as age, health problems, protection from environment, climatic conditions, special occasion etc. Clothing boosts our self-confidence and helps to express our individuality to others [1]. The basic satisfaction in clothing is to feel fit and comfortable. The comfort factor plays major role in clothing for people with motility issues. Adaptive clothing have been introduced to meet the demands of these people. Their economic convenience should also be considered on purchase of these clothings.

Adaptive clothing refers to the clothing designed with various style and design features that helps with dressing and undressing easily for persons with mobility impairments or physical limitations. Adaptive clothing reduces the challenges faced by individuals with special needs and makes to feel better. It also provides quicker approach to medical needs for the individuals requiring high level of care by others [2]. Moreover, adaptive clothing improves functional performance, provides exceptional comfort, and reduces physical effort and burden on caregivers [3]. Many designers are working in adaptive clothing design to facilitate ease of dressing for the specially challenged and aged population. One such to cite, aadaptive clothing design innovations were developed by Mindy Scheier, a former fashion designer and mother of a disabled child. She focused on three areas: (a) magnetic closures; (b) adjustable waistband, sleeves, and legs of pants; and (c) the ability to wear and take off clothing with different placket placement positions. Scheier fostered strong allyships and trust with individuals with special needs by actively involving them in every step of her design process. Furthermore, she worked to strike a delicate balance between the requirements of the clothing industry and the unique needs of individuals with special challenges, ensuring that her adaptive design elements were seamlessly integrated into mainstream clothing. [4]

The need for this study arises from the fact that ready-made clothing is often unsuitable and non-functional for individuals with disabilities and elderly people with limited physical mobility. With the global prevalence of disabilities on the rise, there is an increasing demand for clothing designs that address the unique requirements of individuals with physical disabilities. To address these challenges and maximize the benefits of adaptive clothing, it is crucial to conduct a comprehensive investigation into the needs of the target group. This investigation should consider both physical and psychological aspects, as overlooking any of these factors may negatively impact user acceptance of adaptive

products.[5], elderly woman is considered as the target group in this study. The problem identified among the elderly women is they often experience decreased mobility and flexibility, which hinder the intricate steps involved in sari draping, such as pleating, tucking, and securing pallu (the loose end of the sari). Arthritis and other joint-related issues exacerbate these challenges, making tasks like tying knots or adjusting pleats painful and cumbersome. Addressing these challenges requires a multifaceted approach, encompassing innovative design adaptations in sari construction, such as magnetic closures or pre-stitched pleats that facilitate easier manipulation and reduce physical strain. Education and training programs can empower elderly women and caregivers with techniques for simplified sari draping and maintenance. By understanding and addressing the challenges faced by elderly women in wearing the sari, this paper advocates for inclusive design solutions and supportive strategies that enhance their comfort, independence, and enjoyment of this cherished cultural attire.[6]

2. REVIEW OF LITERATURE

Adaptive clothing can help withstand discomforts like incontinence and shakiness. With the right fabric features, adaptive garments make people more self-reliant, comfortable and secure. The following factors should be considered in the development of adaptive clothing for elderly. The key factor to be considered in development of adaptive clothing is that the clothing should not affect regular activities of elderly to any extent. Ergonomics helps in dissolving the movement issues caused due to improper clothing. Ergonomics is an applied science that helps with designing a product with better efficiency and usage with its surrounding. The differences in the rate, precision and reliability between the naked body and dressed body is clearly visible. The adaptive clothing should be developed ensuring the freedom in range of motions of joints. The postures of human body during working and resting conditions, anthropometric body dimensions, the movement of joints are the other factors to be noted in the development of adaptive clothing. Anthropometry is a branch of ergonomics that provides proper dimensions of human body that helps in development of appropriately fit clothes. It analyses the complexity and diversity of human proportion further accurately which improves the fit of the clothing [7]

The skin for older adults is very delicate and fragile. It must not cause irritation or prickling effect to their skin and must be flexible for their better movement. The fabric should be of high quality and should withstand high cleaning procedures. The fabric should

enhance medical needs as well as fashionable needs. The following parameters should be taken care in selection of fabric for adaptive clothing - appearance, longevity or durability, elastic properties, hand properties, tactile property, thermal property, breathability, drapability, anti-static property, stain resistant, water absorbent, flame retardant, slip resistant, stability property, wrinkle resistant, antimicrobial, thickness and weight of the fabric, soil release parameters [8]. The style features incorporated in their garments must satisfy both aesthetic features as well as motility factors. The essential point to be considered during designing adaptive clothing is that it should appear similar to that of standard or normal clothing. The functional design details implemented in their clothing must improve their quality of elderly life. The style features used should conceal the attention towards their disabilities. The level of independency of the patient for their activities of daily living (ADL) plays a major role in design development of adaptive clothing for elderly. The style features should not limit their movements or any other activities and it should reduce their stress in adorning themselves [9].

The attractive design details like trending prints and embroidery, shimmery finishes, solid colours, decorative trims and accessories, fashionable designs makes adaptive clothing competitive to standard clothing. These details conceals the visual attention towards their physical impairments [10]. The fabric designs details are chosen from the following major categories are natural, geometric, abstract or historic. The design details enforced on the garment should satisfy the five principles of design (emphasis, harmony, balance, proportion, and rhythm). The different types of prints like classical, floral, checks, geometric, self, computerized, wild, abstract, numerical, photo-prints. The addition of these design details in adaptive clothing should make them look dignified, generous, elegant, decent and not take away their appropriate elderly characteristics [11,12]. The type of accessories like sewing thread, cords, lining and interlining, shoulder pads, ribbons, laces, labels, fasteners should also be taken care to avoid discomfort to the wearer in using adaptive clothing. The important characteristic is fasteners used here must be easily detachable, fusible and should be made less prominent to the viewers. The type of fasteners that could be used in adaptive clothing are Hook and eye, Velcro, Zippers- invisible zipper, two way open ended zipper, coil zipper, metal zipper, Buttons – glass buttons, stud buttons, flat buttons, cloth buttons, shanked buttons, Toggles, Magnetic snaps, rivets [13]. As an outcome, establishing partnerships among stakeholders such as academics, designers, customers,

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healthcare providers, and caregivers could help to bridge the gap between research and practice and provide future adaptive clothing ideas a stronger foundation. The involvement of fashion design students may also help to develop a more socially conscious sector. [14]

3. METHODOLOGY

The methodology had been planned in three phases. The deliberate strategy adopted in this study is illustrated in the figure. 1
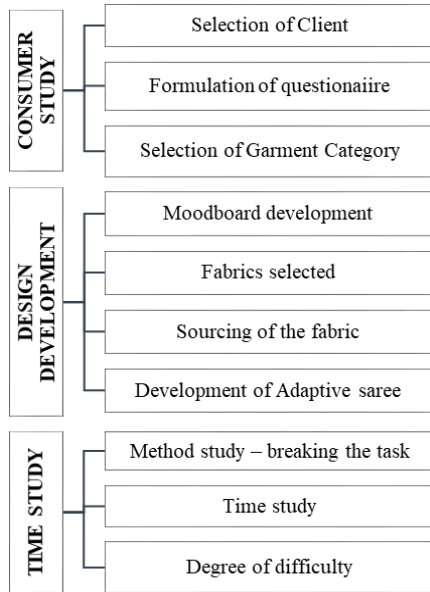

Fig:1 Procedure followed in the study

3.1. Consumer Study

The product planned to develop in this study is adaptive sari, which is suitable to wear during auspicious functions like wedding, engagements, temple festivals. Party wear is chosen because the elderly people are reluctant to attend many of the important family functions due to their difficulty in dressing up aesthetically. The segment of elderly is unattended in clothing sector at retail outlets as well; this study is an initiative to have a separate segment in the retail units for elderly adaptive clothing.

3.1.1. Selection of client

The client selected for the study was Mrs. Saraswathi S. residing at Tirupur. The interest, likings, difficulties were analyzed well before developing designs for her. Her age is 77 years and she is partially dependent. She uses wheel chair for her movement. She had an occasion of her grand daughter's wedding. Her physical movements were observed and analyzed.

3.1.2. Formulation of questionnaire

A self-structured questionnaire cum interview was the method used to understand the client's physical and clothing needs. A questionnaire were structured on three major key aspects like the health, clothing needs and preferences in clothing. The general information had the following divisions to be filled like name, age, locality, source of income, annual income. Health profile like health ailment, duration of ailment, dependency and independency for ADL (activities of daily living), Difficulties in movement of hands and legs, Aids used for mobility. Preferences in clothing during special occasions. This segment had most preferred outfit during special occasions like difficulties while wearing clothing, fabric preferences, fastener preferences, sleeve preferences, fabric design preferences, colour preferences, fitting preferences.

3.3.3 Selection of Garment Category

Sari and blouse is the garment chosen for the study, as this is traditional outfit worn by the women in Southern part of India. The category selected is party wear like wedding, engagement, as they find it difficult to adorn themselves during special occasions. Personal grooming becomes difficult for them and it is one of the reason they avoid attending many auspicious functions.

3.2. Design Development

The design development process includes collective process of chart represented in Fig 2. Based upon the results obtained on analysis of survey, the difficulties faced by the client during dressing was analyzed and the garments were designed to provide solution to her difficulties. The garments were designed and constructed with a complete solution for each and every problems faced by them. The category selected for the study was functional wear - Sari, as it is the traditional garment of the South India.

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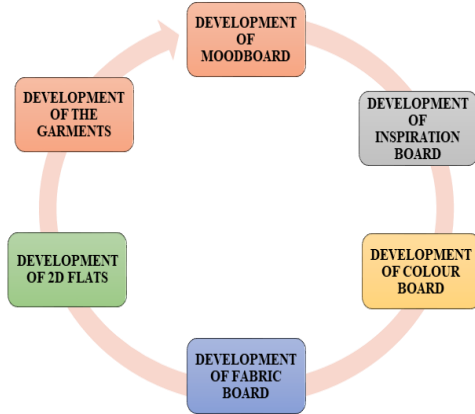
Fig. 2. Design development stages

3.2.1. Development of Mood board

An in-depth brainstorming was done to identify the requirements of adaptive clothing. The min-mapping technique was used to do the brainstorming to get diversified ideas to do the project. The colour, fabrics, fasteners used, elderly physical and emotional factors many factors has been considered.

The next step was the development of mood board, the concept chosen was "Positive Aura". A positive aura is often described as an energetic field that surrounds a person and emits a sense of positivity, warmth, and well-being. People who are perceived to have a positive aura are typically seen as approachable, kind, and uplifting. A holy place, also known as a sacred or spiritual site, is a location revered and recognized for its spiritual significance. These places often hold historical, cultural, and religious importance, attracting pilgrims and visitors seeking spiritual growth, healing, and a connection to the divine. The connection between a holy place and a positive aura is profound. Holy places are often imbued with a sense of sacredness and tranquility that can enhance one's positive energy and spiritual well-being.

Fig. 3. Mood board developed based on the concept "Positive Aura"

3.2.2. Fabrics selected for the adaptive sari

The fabric selected for the study is silk, as this fabric is the queen of textiles and been used by women during any auspicious functions. Silk saris have a rich cultural heritage in India, often worn during weddings and festive occasions. silk saris remain a preferred choice for elderly women attending weddings, addressing both practical and cultural dimensions that contribute to their enduring popularity. The practical aspects of silk saris for elderly wearers, including considerations of fabric comfort, ease of draping, and maintenance. Silk's absorbency makes it comfortable to wear in warm weather and while active. Its low conductivity keeps warm air close to the skin during cold weather.

3.2.3. Sourcing of the fabric

Silk saris had been sourced from the retailers at Peelamedu in Coimbatore. Saris were converted into functional designed garments (Sari with blouse); wherein the drape of the product will be much easier. These products will facilitate the elderly women to adorn the sari quickly and easily in spite of their physical disabilities. Ergonomics plays an important role in the search for this state of comfort. Ergonomics comprises several aspects, such as posture and body movements (sitting, standing, pushing, pulling and lifting), environmental conditions (climate, lighting, noise and vibrations) and the relationship between jobs and tasks (appropriate and interesting). It is with the combinations of these requirements that is possible to develop safer, healthier, more comfortable and more efficient projects in the context of the daily life of the elderly.

3.2.4. Development of Adaptive sari

The client selected for the study was based on convenience sampling, as she and her relatives agreed to be the client and experiment the product developed for her. The personal liking of the client Mrs. Saraswathi was analyzed completely by meeting her personally. The designed sari is referred as Single Piece Style Sari (SPSS) in this paper. Sari is an ensemble worn with a blouse and a skirt. The adaptive sari designed is a single piece garment where the skirt and the blouse has been attached with the pre-pleated sari. This facilitates the dressing since the client uses wheel chair for mobility and is partially dependent. Four designs were created in this style (SPSS 1, 2, 3 and 4). The common design element in the design detail was that it has to be worn through the head and

the fastened at the front. The fasteners used are zipper, velcro, buttons. The blouse was constructed and the sari pleats are stitched at the waist based on the measurements and it was made as a skirt. Next step is the two components were seamed together at the waist region.

SPSS 1 is the first style of the single piece sari style with the colour combination of orange and green. The sari has been pre pleated at the waist and at the shoulders. The lower part was made as a skirt and the blouse was stitched with a princess line for the structure. It is a front open garment with velcro as fastener.

Fig.4. The step-by-step draping of style SPSS 1

SPSS 2 is the second style of the single piece sari style with the orange and golden colour combination. The sari is pleated at the waist and at the shoulders. The lower part is made as a skirt and the blouse is stitched with a princess line for the structure. The placket is given from the shoulder down through the sleeve center at both sides. The fastener used was velcro that helps to easily fasten the garment.

Fig.5. The step-by-step draping of style SPSS 2

SPSS 3 is the third style of the single piece sari style with purple and mustard colour combination. The sari is pleated at the waist and at the shoulders. The lower

part is made as a skirt, where in the waist pleats and shoulder pleats are arrested. The blouse is stitched with a princess line for the structure. One side of the sari is fully opened from the under arm seam and side seam. The opening is connected with velcro. The step-by-step draping procedure is shown in the figure 6. Once the Velcro is fastened at the sides the free end of the sari can be draped over it to the front part.

Fig. 6. The step by step draping of style SPSS 3

SPSS 4 is the fourth style of the single piece sari style is with sandal and brown colour combination. The sari is pleated at the waist and at the shoulders. The lower part is made as a skirt and the blouse is stitched with a princess line for the structure. It is a front open garment with zipper as fastener. A metal ring is given in the zipper for easy pulling and closing the blouse.

Fig. 7. The step by step draping of style SPSS 4

3.3. Time and Motion Study

Time study is the technique of establishing an allowed time standard to perform a given task, based upon measurement of work content of the prescribed method, with due allowance for fatigue, personal and unavoidable delays. A periodic investigation of dressing with normal and adaptive sari was conducted among the elderly women initially to compare with that of developed adaptive saris.

3.3.1. Breakdown of the task of normal sari draping

The normal sari consist of 3 garments to complete the ensemble namely sari, blouse and in-skirt. The task of dressing a normal sari is breakdown into sequence of element like blouse - insertion of right hand, left hand, pulling the front bodice, fastening hooks; in-skirt - in skirt wearing and cord adjustment and tying, sari – tucking the starting to the in-skirt, rounding the remaining pleating pallu, taking front pleats. The task of dressing the adaptive sari was also noted and time taken was recorded. The breakdown of normal sari is given herewith.

Step 1 - make a knot on the plain end of the saris and tuck inside the petticoat.

Step 2 - Continue to swaddle the saris from the left side until the start point is reached.

Step 3 – Take another one complete round to swaddle the sari. Make sure that the lower end of the sari should be little above the floor. After that, temporarily pleat the other end of the sari (pallu) and put cross over the shoulder. The extra fabric is left in the front is pleated.

Step 4 , 5 & 6 - After making the pleats, it has to be tucked inside the petticoat and most important thing in between this process is to secure the sari with the safety pins, especially at the left side of the waist. The securing the sari with pins will keep the sari intact to carry it easily.

Step 7 and 8 - the styling of the pallu. While styling the pallu of the sari, first place it over the left shoulder.

Furthermore, in styling the pallu, there are two choices – first, keep the pallu-pleated one or second let it flow openly. The observations of dressing activity of daily living DADL of the selected client were done and the method of draping the sari for the four SPSS styles were also recorded.

Fig.8. The steps in draping a normal sari

3.3.2. Time Study

Stop watch method is used for data collection. Here the times taken to complete the tasks are noted down from the stopwatch and recorded. The standard tools of time study like stopwatch and study sheets are used.

The method used for conducting the study is fly back method**.** In this method, the stop watch is started at the beginning of the first element and at the end of the element the reading is noted in the study sheet. At the same time, the stop watch hand is snapped back to zero. This is done by pressing down the knob, immediately the knob is released. The hand starts moving from zero for timing the next element**.** The average time taken to complete each process and degree of difficulty of the normal sari draping and developed adaptive sari draping were recorded and tabulated.

3.3.3. Degree of difficulty

Many of the tasks in the developed adaptive clothing are eliminated as that compared to the normal sari draping. The time taken for doing the above tasks was noted and the readings were taken for five sets and the average of them is noted down. The average values are tabulated.

The degree of difficulty is expressed on a scale of 1-5 where 1– Very difficult; 2 – Difficult; 3 – Neutral; 4 – Easy; 5 – Very easy. The rating was given by the care taker for each step of draping the developed Single Piece Style Sari (SPSS).

The recordings of ADL, average time taken and degree of difficulty in draping the sari for the client are recorded and tabulated. The Tabulated data are analyzed and interpreted. The total degree of difficulty was calculated using the following formula (1)

$$\text{Degree of difficulty} = \frac{\text{Total degree of difficulty of individual saree}}{\text{Number of stages in dressing}} \quad (1)$$

4. RESULTS AND DISCUSSION

Results and discussion is divided into the 2 parts, the first part is the direct consumer survey to understand the prefences of the client. The second part was the the timestudy of the adative clothing developed and the respodents feedback.

4.1. Data consolidation of the client

4.1.1. General information of respondents

The general information had the following divisions to be filled
1. Name   - Mrs. Saraswathi
2. Age   - 77 years
3. Locality   - Tirupur, Tamil Nadu
4. Source of income - Pension of her husband
                    Late. Narayanan
5. Annual income - ₹ 1,80,000

4.1.2. Health Profile

1. Health ailment   - arthritis, diabetic, severe
                      Joint pains
2. Duration of ailment- 4 years and 4 months
3. Dependency and independency for ADL (activities of daily living) – partially dependent
4. Difficulties in movement of hands and legs – she can't raise her hands above her shoulder and she is unable to walk long distance.
5. Aids used for mobility - Use wheel chair for movement outside home.
6. Psychological condition: Widow, insecurity, Depressed, Lonely, Love to listen old songs.

4.1.3. Preferences in clothing during special occasions

1. Difficulties while wearing clothing - she cannot wear hooks; she gets the help of her care taker to dress up. As she cannot stand for long hours, it is very difficult to dress her up. Hence, she prefer to wear single piece nighty. Her caretaker dress her up.
2. Fabric preferences - silk and silk cotton for party wear
3. Fastener preferences – that doesn't irritate
4. Sleeve preferences - short
5. Fabric design preferences – floral
6. Colour preferences – orange, green
7. Fitting preferences – semi fit.

4.2. Time and Motion Study of the Sari Draping

The time taken by the identified client to drape the sari was noted. This will facilitate to understand the easiness in using adaptive clothing.

4.2.1. Time and motion study of the sari draping

The client is partially dependent and hence single piece sari style (SPSS) is designed for her to meet her needs. The garment can be worn as a single piece dress, where the sari, blouse and skirt are stitched together. The dress activity of daily living of the identified client for draping a normal sari, blouse and skirt is recorded and tabulated in table 1. The main objective of this is to compare with that of the developed adaptive sari.

Table 1. DADL, Time taken and the degree of difficulty of Normal sari for client

S.No	DADL	Average time taken (in seconds)	Degree of difficulty
Blouse			
1.	Sleeve insertion (left hand)	69	1
2.	Sleeve insertion (right hand)	64	1
3.	Fastening blouse hooks and eye	183	2
Skirt			
4.	In-skirt wearing over the head	72	4
5.	Cord adjustment to the sides	42	3
6.	Tying the cord	146	2
Sari			
7.	Tucking the end of the sari in the petticoat.	32	3
8.	Swaddle the sari	48	2

S.No	DADL	Average time taken (in seconds)	Degree of difficulty
	from the left to the right (till you reach the starting point).		
9.	Second swaddle the sari from the hips to drape the pallu	38	3
10.	Planning the length of the pallu and put cross over the shoulder	56	1
11.	Pleat the extra fabric at front waist	548	1
12.	Tuck in the pleats to the in skirt.	102	1
13.	Secure the pleats with pins or clips	68	2
14.	Pleating the pallu and placing over the shoulders across the bust	512	1
15.	Securing the pallu in the shoulder with the pins	118	1
	Total	**2098**	**28**

The dress activity of daily living is recorded for the adaptive sari developed SPSS – 1, 2, 3 and 4 are tabulated in tables 2, 3, 4 and 5 respectively. This varies from person to person. The time taken by the identified client to dress by the care taker is recorded here.

Table 2. DADL, Time Taken and the Degree of Difficulty of Single Piece Sari Style (SPSS 1)

S.No	DADL	Average time taken (in seconds)	Degree of difficulty
Sari, blouse and skirt (single piece garment)			
1.	Put the garment over the head around the neck	60	4
2.	Sleeve insertion (left hand)	42	3
3.	Sleeve insertion (right hand)	40	3

S.No	DADL	Average time taken	Degree of difficulty
4.	Fastening blouse with velcro	64	4
5.	Swaddle the sari around the hip to drape the pallu	36	3
6.	Put the readymade pleated pallu on the shoulder across the bust	34	4
7.	Secure the pallu with the blouse using pins at the shoulder	68	3
	Total	**344**	**24**

From the table 2, it is evident that the 7th task is maximum time consuming, as the pleated pallu has to be fastened using a safety pin to the sari blouse and the same has higher degree of difficulty in dressing as well. The sleeve insertion was also difficult for the wearer. The time taken and the degree of difficulty of Single Piece Sari (SPSS 2), are tabulated in table 3. The total time taken to dress the sari is 343 seconds and the degree of difficulty is 24.

Table 3. DADL, Time Taken and the Degree of Difficulty - Single Piece Sari Style (SPSS 2)

S.No	DADL	Average time taken (in seconds)	Degree of difficulty
Sari, blouse and skirt (single piece garment)			
1.	Put the garment over the head around the neck	62	5
2.	Fastening the shoulder and centre of the sleeve line with velcro (left hand)	68	4
3.	Fastening the shoulder and centre of the sleeve line with velcro (right hand)	72	4
4.	Swaddle the sari around the hip to drape the pallu	36	3
5.	Put the readymade pleated pallu on the shoulder across the bust	41	4

S.No	DADL	Average time taken (in seconds)	Degree of difficulty
6.	Secure the pallu with the blouse using pins at the shoulder	64	4
	Total	**343**	**24**

From the Table 3, it is evident that the 3rd task is maximum time consuming, as the fastening used was Velcro, it was difficult to paste it perfectly and 4th activity has higher degree of difficulty in dressing.

Table 4 - DADL, Time Taken and the Degree of Difficulty of Single Piece Sari Style (SPSS 3)

S.No	DADL	Average time taken (in seconds)	Degree of difficulty
Sari, blouse and skirt (single piece garment)			
1.	Sleeve insertion (right hand)	42	4
2.	Fastening the underarm seam and side seam with velcro (left hand)	126	4
3.	Swaddle the sari around the hip to drape the pallu	38	3
4.	Put the readymade pleated pallu on the shoulder across the bust	36	4
5.	Secure the pallu with the blouse using pins at the shoulder	66	3
	Total	**308**	**18**

From the Table 4, it is evident that the 2nd task is maximum time consuming, as the Velcro used as fastener occupies the entire seam from lower arm to the side seam and the activity 3 and 5 has higher degree of difficulty in dressing. The time taken and the degree of difficulty of Single Piece Sari (SPSS 4), are tabulated in table 5. The total time taken to dress the sari is 305 seconds and the degree of difficulty is 28

Table 5 - DADL, Time Taken and the Degree of Difficulty of Single Piece Sari Style (SPSS 4)

S.No	DADL	Average time taken (in seconds)	Degree of difficulty
Sari, blouse and skirt (single piece garment)			
1.	Put the garment over the head around the neck	62	5
2.	Sleeve insertion (left hand)	42	4
3.	Sleeve insertion (right hand)	38	4
4.	Fastening blouse with zipper with a ring (for easy pulling)	36	5
5.	Swaddle the sari around the hip to drape the pallu	34	3
6.	Put the readymade pleated pallu on the shoulder across the bust	32	4
7.	Secure the pallu with the blouse using pins at the shoulder	61	3
	Total	**305**	**28**

From the Table 5, it is evident that the 1st task is maximum time consuming, but it was very easy to put it on the wearer. Zipper used as fastener which facilitated the opening and closure of the garment easily. Activity 5 and 7 were considered little difficult.

5. CONCLUSION

Among the four developed adaptive sari the time taken for dressing is less in the SPSS 4 and the degree of difficulty is also 4 (easy), hence this becomes favorite among the four. The reason is the fastener used in the blouse part is zipper and it is facilitated with a ring in the puller. The SPSS 2 takes more time to dress but it is has very few steps in dressing compared to other model saris and the degree of difficulty is 4. The reason for time consuming is one side of the adaptive clothing is fully fastened with the Velcro, it needs some perfection in fastening, but the degree of difficulty is 4.

Table 6. Comparison of normal sari and the 4 developed adaptive sari (SPSS)

S.No	Sari style	Total Time taken (seconds)	Degree of difficulty (sum)	No of operations	Degree of difficulty
1.	Normal sari	2098	28	15	1.5
2.	SPSS 1	344	24	7	3.4
3.	SPSS 2	343	24	6	4
4.	SPSS 3	308	18	5	3.6
5.	SPSS 4	305	28	7	4

The table 6 clearly explains the comparison between the time taken and the degree of difficulty in draping the normal sari and the 4 developed adaptive sari for the selected client.

Additionally, research could explore alternative fasteners or mechanisms to improve user independence and comfort. Expanding the range of adaptive sari designs to incorporate diverse fabric types, styles, and cultural preferences would broaden their appeal, ensuring greater acceptance and inclusivity. Moreover, adaptive designs could be further developed to accommodate individuals with varied disabilities, including visual or cognitive impairments, fostering a more inclusive approach to functional fashion.

6. ACKNOWLEDGEMENT

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