Designing Cloth Shoes for Elderly People Facing Challenges in Wearing Conventional Footwear

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Abstract- Many elderly individuals struggle with standard shoes because of age-related issues like stiff joints, swelling, physical deformities, and decreased stability. These obstacles often diminish their comfort and personal autonomy. This research explores the creation of specialized cloth footwear designed to bridge the gap between traditional shoes and the specific needs of the elderly. By prioritizing a user-centered, ergonomic approach, the design utilizes lightweight fabrics and intuitive fastening mechanisms to ensure the shoes are safe and easy to put on. The development process utilized cotton, terry, and woolen handloom jacquard to produce prototypes, which were then tested by both older adults and their caregivers. Evaluations focused on fit, ease of use, and as well as the visual appeal impact of the design. The results suggest that these cloth shoes provide a more comfortable, user-friendly experience than traditional options. Ultimately, this study demonstrates that textile-based adaptive footwear serves as a practical, dignified solution that supports the mobility and confidence of an ageing population.

Key: Cloth shoes, Comfort, Elderly individuals, Footwear, Mobility

I. INTRODUCTION

Ageing is an inevitable biological process that brings with it numerous physical, psychological, and social changes. Among the most affected parts of the body during the aging process are the feet, which serve as the foundation of human mobility and balance. As individuals age, the body undergoes physiological changes that significantly affect mobility, balance, and comfort. Among these, the feet the body's primary support structure experience loss of elasticity, changes in shape, and reduced circulation, often leading to pain or swelling. Proper footwear plays a vital role in preserving mobility and preventing injuries in elderly people. However, conventional footwear is often heavy, rigid, or difficult to wear, particularly for those with arthritis, edema, or limited flexibility. The feet bear the entire weight of the body and are exposed to constant mechanical pressure, friction, and stress throughout life. Over time, the skin becomes thinner, joints stiffen, muscles weaken, and the arches of the feet may flatten. These physiological changes increase the risk of discomfort, pain, and instability while walking [1]. [2] further emphasize that these age-related foot changes directly impact balance and walking efficiency. For elderly individuals, comfortable and functional footwear is not merely an accessory it is a necessity that determines their ability to move safely and maintain independence. However, many conventional shoes are not designed to meet the specific anatomical and functional needs of aging feet. Tight fittings, hard materials, and complicated closures make it difficult for older adults to wear and remove shoes. Those suffering from arthritis, edema (swelling of the feet), or diabetic neuropathy find conventional footwear particularly uncomfortable, sometimes even impossible to wear [3]. [4] highlight that evaluating these specific footwear problems is critical for geriatric care. Individuals with diabetes, chronic disease, nondiabetic neuropathy, and inflammatory conditions are at a severe disadvantage. Further complications of foot pathology, which include cellulitis, ulcerations, and difficulty in maintaining balance, have increased the risk of serious injuries and fractures from falls. Studies have shown that adults older than 65 years fall at least once per year on average, some of which are attributed to generalized thinning of skin and fat pad atrophy. The increased risk of falls may highlight the need to

promote preventative measures to combat this issue. One of these measures may include wearing appropriate footwear. Unfortunately, little current data or research focuses on the role of footwear in the prevention of inactivity in the elderly patients [5]. The growing elderly population worldwide highlights the need for more inclusive, adaptive, and compassionate design approaches in apparel and footwear. According to the [6], 2050, the number of people aged 60 and above will nearly double to 2.1 billion globally. With this demographic shift, the demand for supportive footwear that enhances comfort, balance, and dignity is expected to rise significantly.

Footwear plays a crucial role in maintaining postural stability and mobility. However, the majority of commercial footwear is designed for younger, active consumers with standard foot dimensions. Elderly users often face multiple barriers when using traditional shoes: difficulty in bending down to wear or tie them, discomfort caused by swelling, poor ventilation, and pain from stiff materials. As a result, some elderly individuals avoid wearing shoes altogether, leading to reduced mobility, higher risk of injury, and diminished confidence in walking [7]. [8] Systematic review of shoe design reveals a significant gap in optimal footwear elements for older adults. Many falls experienced by older people result from age-related deterioration of the balance and neuromuscular systems. Most falls occur during motor tasks and footwear has been identified as an environmental risk factor for both indoor and outdoor falls. By altering somatosensory feedback to the foot and ankle and modifying frictional conditions at the shoe-sole/floor inter-face, footwear influences postural stability and the subsequent risk of slips, trips, and falls. While the primary role of a shoe is to protect the foot and facilitate propulsion, fashion has strongly influenced the design of footwear throughout the ages, compromising the natural functioning of the foot. As a result, little is known about what constitutes safe footwear for older people undertaking activities in and around the home. Because footwear appears to be an easily modifiable risk factor for falls, identifying the specific shoe features that might facilitate or impair balance in older people is imperative for the design of targeted fall prevention interventions and provision of evidence-based recommendations. In this systematic review, we initially describe the types of footwear commonly worn by older people. We then highlight studies in which footwear has been recognized as a risk factor for falls [9]. Medical or orthopaedic footwear currently available on the market often emphasizes functionality over appearance, resulting in designs that may appear clinical or unattractive. This lack of aesthetic appeal can discourage regular use and negatively impact an individual's self-image. Moreover, such shoes are typically made from synthetic or leather materials that lack the breathability and softness needed for fragile skin. Therefore, there is an urgent need for an innovative design solution a footwear type that combines comfort, safety, simplicity, and aesthetics. Constructing cloth shoes for elderly persons who cannot wear traditional footwear due to pain, swelling, or disability addresses this gap by offering a user-friendly, flexible, and health-conscious alternative. Unsafe or unsuitable shoes affect balance and gait, and might play an important role in increasing fall risk with ageing. Although the literature points to the risks that arise when older people wear shoes that provide little support, the shoe market has not responded with specific designs of footwear for older people, apart from usually expensive (semi-)orthopedic shoes. As good shoe design might be a preventative factor for falls, we were interested in determining which elements of footwear, excluding (semi-) orthopedic shoes, are important for stable balance and gait performance, and for minimizing fall risk [10].

In this context, cloth shoes present a promising solution. They are lightweight, breathable, flexible, and soft characteristics that make them highly suitable for elderly individuals who cannot tolerate the rigidity or weight of conventional footwear. Constructing cloth shoes tailored for the elderly not only fulfils functional requirements but also promotes psychological comfort, as these shoes can be made stylish, washable, and affordable. This study emerges from the intersection of textile science, ergonomics, and human centered design. It recognizes that the design of footwear for elderly individuals is not merely a technical process but a compassionate response to physical limitations and emotional needs. Cloth shoes are unique because they are soft and adjustable, reducing friction and pressure on sensitive skin. They can be constructed using materials such as cotton, bamboo, or knitted textiles that allow breathability, temperature regulation, and hygiene [11]. Furthermore, the flexibility of fabric allows the shoe

to adapt to various foot shapes and swelling conditions, ensuring comfort without the need for rigid structure or high-cost production. From a design perspective, constructing cloth shoes also opens a new path for sustainable fashion promoting biodegradable, washable, and locally produced footwear [12]. Unlike synthetic or leather shoes, which contribute to environmental pollution, cloth-based designs support eco-conscious and affordable innovation. Most importantly, this study upholds the dignity and comfort of elderly individuals. A thoughtfully designed pair of shoes can enable them to walk safely, feel confident, and live independently. In this sense, the study not only addresses a functional issue but also contributes to social well-being and emotional health [13].

The construction of cloth shoes for elderly persons holds significance in several domains such as Health and Comfort: Soft fabric-based footwear can reduce pressure sores, enhance air circulation, and prevent infections, making it suitable for those with diabetic or arthritic conditions [14]. Mobility and Independence: Well-designed shoes can restore the confidence of elderly individuals to move safely without assistance, thereby improving their quality of life [15]. Innovation in Design: This project integrates the principles of ergonomic and adaptive design in the context of aging, offering a model for future innovations in geriatric fashion technology [16]. Sustainability: The use of biodegradable and washable materials aligns with sustainable production goals and reduces waste in the fashion industry [17]. Economic Accessibility: Modular and customizable designs are essential for future economic sustainability in the shoe industry [18].

II. METHODOLOGY

The methodology for the cloth shoe footwear study comprises as below:

2.1 Identifying the Physical Limitations of Elderly Individuals

Age-related factors such as reduced muscle strength, limited joint flexibility, swelling of the feet, impaired balance, and difficulty bending down often make conventional footwear hard to wear and uncomfortable for prolonged use [19]. Many older adults also experience conditions such as arthritis, diabetes, or neuropathy, which increase sensitivity and demand soft, non-restrictive materials and adaptive closures. Walking difficulty among elderly individuals is a multifactorial problem influenced by physical, medical, and environmental factors. One of the primary causes is age-related muscle weakness, particularly in the lower limbs, which reduces walking speed and balance. Joint disorders such as osteoarthritis lead to pain, stiffness, and limited mobility, making walking uncomfortable [20]. This insight has led the researcher to identify and undertake the topic on designing cloth footwear for elderly individuals.

2.2 Selection and Collection of Information from Elderly Individuals

250 elderly individuals randomly irrespective of gender above 60 years who had difficulty in walking and cannot wear conventional shoes were chosen in and around Tiruppur and Coimbatore to collect the information about their indoor and outdoor walking surfaces, daily activities and climatic conditions. The information was collected from selected elderly individuals, care assistants when and where available, daughter, son, son-in-law and daughter -in-laws, that the Conventional footwear often fails to meet the specific needs of elderly persons due to age-related changes in foot structure, mobility, and sensory perception. Standard shoes are usually designed with rigid soles, narrow toe boxes, and fixed closures, which can cause discomfort and difficulty while wearing. Elderly people prefer footwear that is comfortable, safe, and easy to wear. Important features include a proper fit with sufficient toe space, lightweight construction, soft and breathable materials, non-slip soles for fall prevention, and simple fastenings such as Velcro to support independence and stability while walking. This view was supported [21], which has formed a foundation for developing adaptive cloth footwear that enhances comfort, safety, independence, and overall quality of life for elderly individuals. This data on real problems faced by elderly individuals provided valuable insights for designing cloth footwear that genuinely supports their daily mobility and comfort needs.

2.3 Selection of Footwear

Cloth foot shoes as footwear was seleted for the elderly individuals in this study by the investigator.

2.4 General Parts and Functions of a Cloth Shoe Footwear

The cloth shoe foot wear general parts are displayed in Fig.1.

Each part of a cloth shoe foot wear shown in Fig.1 has a special job, as The upper holds your foot in place, The insole adds cushioning and fits the shape of your foot, The midsole (not always visible) absorbs shock and gives bounce, The outsole touches the ground and provides grip, The heel counter is a semi-rigid insert located in the back of the shoe the cups the heel bone,

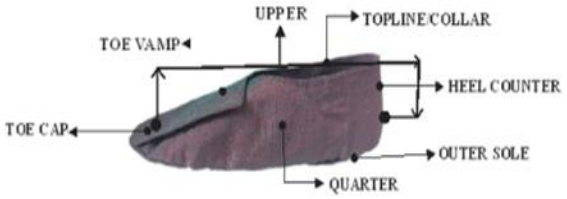


FIG.1

PARTS OF CLOTH SHOE FOOT WEAR

2.5 Selection of Material for Cloth Shoe Footwear

For cloth shoe footwear, the material preferences and selection should be lightweight, high breathability, and ease of cleaning with simple fastening systems, while designing and constructing which must be carefully considered to ensure acceptance and long-term use [22]. Considering the age of the elderly individuals, seasons were also taken into consideration. Cotton, light weight material was selected which will be comfortable for them to wear in summer. During winter, depending on the individual preference, felt or woolen handloom jacquard materials can be used by them. Based on the feedbacks and age factor, natural materials such as Cotton(C) (Plate 1), Terry(T) (Plate 2) and Woolen Handloom Jacquard ($W^{H}J$) (Plate 3) fabrics were selected for the study, which will be soft in nature, breathable, non-slippery and comfortable for elderly individuals.

2.6 Considerations on Designing Cloth Shoe Footwear

Designing cloth shoes involves a careful balance of comfort, functionality, and user-centered considerations to create footwear that meets the everyday needs of the intended population. The process begins with understanding user requirements, including fit, mobility, softness, breathability, and overall ease of use. Cloth materials such as cotton, canvas, mesh, fleece, felt or terry fabrics can be

The toe box gives space for your toes to move and The laces and eyelets let you adjust the fit tightly or loosely. The Main Parts of a Cloth Shoe Footwear are Toe Cap, Toe Vamp, and Outer sole are the most basic components of a shoe. However, other minor components make up the remainder of the shoe. Collar, Heel Tab, Heel Counter, Midsole, Eyelets, Insole, and shoelace are among them. The construction of these shoes will increase the shoe's comfort and stability.

PLATE 1 COTTON (C) FABRIC | PLATE 2 TERRY (T) FABRIC | PLATE 3 WOOLEN HANDLOOM JACQUARD

selected for their flexibility, lightweight nature, and skin-friendly properties, which help reduce friction and enhance comfort during prolonged wear. The construction process typically includes cutting, reinforcing specific areas with interlining, stitching the upper components, adding cushioned insoles, and attaching flexible outsoles to improve stability and grip. Special attention is given to ensuring proper ventilation, soft inner linings, and accessible closure systems like Velcro or elastic for easy wearing, especially for elderly users. Overall, designing cloth shoes emphasizes comfort-focused materials, thoughtful pattern engineering, and user-friendly construction methods to create footwear that is both functional and comfortable for daily use [23].

2.7 Measurement for Cloth Shoe Footwear by Sole Tracing

FIG- 2 Sole Tracing

The sole of elderly individuals was taken not by measurements but by keeping their sole on top of a paper and tracing the right and left soles on the paper. A plain sheet of pattern paper is placed on a flat surface. The shoe sole (or wearer's foot) is cleaned and positioned flat on the paper in a natural standing position. Proper alignment is ensured so that the heel and toe are straight. The pencil should be held upright to avoid inward or outward distortion. This traced outline forms the basic sole pattern and acts as the foundation for all upper pattern markings. The traced sole image in depicted in Fig 2. The sole measurements were randomly collected from 10 elderly individuals and a sole sample was created and it was same for all the 10 elderly individuals.

2.8 Designing Cloth Shoe Footwear

The cloth shoe designs, are designed in CAD. Six cloth shoe footwear designs were selected for the study. The schematic sketch cloth shoe foot wear designs D1-D6 are depicted from figures 3-8. They are named as CF^{D1}, CF^{D2}, CF^{D3}, CF^{D4}, CF^{D5}, and CF^{D6} respectively.

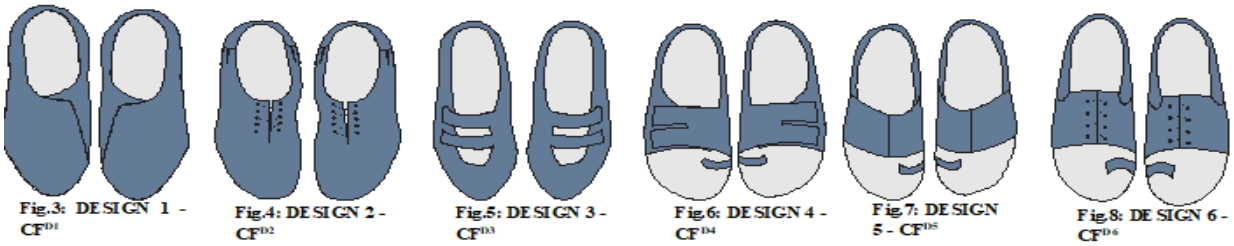


Fig.3: DESIGN 1 - CF^{D1} Fig.4: DESIGN 2 - CF^{D2} Fig.5: DESIGN 3 - CF^{D3} Fig.6: DESIGN 4 - CF^{D4} Fig.7: DESIGN 5 - CF^{D5} Fig.8: DESIGN 6 - CF^{D6}

Figures 3-8: SELECTED SCHEMATIC SKETCH/DESIGNS OF THE CLOTH SHOE FOOTWEAR DESIGNED IN CAD

2.9 Construction of Cloth Shoe Footwear

The construction of designed six CF^{D1} – CF^{D6} cloth shoes are constructed using standard procedure for Sole stitching and Toe cap stitching/ Toe post stitching (Based on design) There are two parts of fabric shoe for stitching. One is the sole and one is the top layer of the fabric footwear. The top layer of the fabric footwear is called as toe box/top cap, upper side and heel cap/counter/backstay. Some steps of cloth shoe footwear are shown in Plates 4-8. The designed and constructed cloth shoe footwear's using Cotton (C) material - 6 designs [$CF^{D1}C$ - $CF^{D6}C$] (Plates 9a – 9f); Terry (T) - 6 designs [$CF^{D1}T$ - $CF^{D6}T$] (Plates 10a - 10f) and Woolen Handloom Jacquard ($W^{H}J$) - 6 designs [$CF^{D1}W^{H}J$ - $CF^{D6}W^{H}J$] (Plates 11a – 11f) are shown respectively.

2.10 Wear Study

PLATE 4 ARRANGING THE SOLE FABRICS RIGHT SIDE FACING

PLATE 5 STITCHING THE RIGHT SIDE CLOTH SHOE FOOTWEAR UPPER PARTS

PLATE 6 TURNING THE RIGHT SIDE UPPER PART OF THE CLOTH FOOTWEAR

PLATE 7 PIN THE TOE AND HEEL COUNTER WITH SOLE OF THE CLOTH FOOTWEAR

PLATE 8 SEWING THE HOOK (SCRATCHY) SIDE OF THE VELCRO IN TOE CAP

Plate 9a: $CF^{D1}C$ Plate 9b: $CF^{D2}C$ Plate 9c: $CF^{D3}C$ Plate 9d: $CF^{D4}C$ Plate 9e: $CF^{D5}C$ Plate 9f: $CF^{D6}C$

PLATE 9: DESIGNED AND CONSTRUCTED CLOTH SHOE FOOTWEARS USING COTTON (C) MATERIAL

Plate 10a: $CF^{D1}T$ Plate 10b: $CF^{D2}T$ Plate 10c: $CF^{D3}T$ Plate 10d: $CF^{D4}T$ Plate 10e: $CF^{D5}T$ Plate 10f: $CF^{D6}T$

PLATE 10: DESIGNED AND CONSTRUCTED CLOTH SHOE FOOTWEARS USING TERRY (T) MATERIAL

Plate 11a: $CF^{D1}W^{H}J$ Plate 11b: $CF^{D2}W^{H}J$ Plate 11c: $CF^{D3}W^{H}J$ Plate 11d: $CF^{D4}W^{H}J$ Plate 11e: $CF^{D5}W^{H}J$ Plate 40a: $CF^{D6}W^{H}J$

DESIGNED AND CONSTRUCTED CLOTH SHOE FOOTWEARS USING WOOLEN HANDLOOM JACQUARD ($W^{H}J$) MATERIAL

The eighteen Cotton (C), Terry (T) and Woolen Handloom Jacquard ($W^{H}J$) designed and constructed cloth shoes shown in Plates 9, 10, 11 are worn by the selected elderly individuals.

2.11 Assessment of User Feedbacks for The Designed and Constructed Cloth Shoe Footwear's

The constructed $CF^{D1}C$ – $CF^{D6}C$ (6), $CF^{D1}T$ – $CF^{6}T$ (6) and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ (6) a total of 18 cloth shoe footwear's were given to six elderly individuals. First subject, (S^{1}) elderly individual was given first design CF^{D1} made of $CF^{D1}C$ (for first week), $CF^{D1}T$ (for second week) and $CF^{D1}W^{H}J$ (for third week) cloth footwear's and were asked to wear them for 3 weeks, while they were walking. Similarly, the other five elderly individual subjects (S^{2}-S^{6}) were also given CF^{D2} – $CF^{D2}C$, $CF^{D2}T$, $CF^{D2}W^{H}J$ for S^{2}; CF^{D3} – $CF^{D3}C$, $CF^{D3}T$, $CF^{D3}W^{H}J$ for S^{3}; CF^{D4} – $CF^{D4}C$, $CF^{D4}T$, $CF^{D4}W^{H}J$ for S^{4}; CF^{D5} – $CF^{D5}C$, $CF^{D5}T$, $CF^{D5}W^{H}J$ for S^{5}; and CF^{D6} – $CF^{D6}C$, $CF^{D6}T$, $CF^{D6}W^{H}J$ for S^{6}, cloth shoe footwear's to wear for 3 weeks respectively while walking.

The subjective feedbacks related to Common foot related problems – age group and gender, common foot related problems (swelling, arthritis, reduced flexibility), ease of wear requirements and special needs of elderly users, obtained from 250 elderly individual subjects who were above 60 yrs irrespective of gender led to the study. Further, feedbacks on material selection and performance – upper fabric (cloth material type – Cotton (C), Terry (T), Woolen Handloom Jacquard ($W^{H}J$)), lining materials (canvas), insole material, outer sole materials (EVA Anti slip sheet) and breathability/softness of materials; Fit and comfort evaluation – ease of foot insertion and removal, fit accuracy and adjustability, pressure distribution on foot and overall comfort during walking and standing; Ease of use and accessibility – hand dexterity requirements, closure handling and grip ease, time required to wear and remove shoes and suitability for users with limited mobility; Ergonomic assessment – foot posture support, Arch support adequacy, Balance / stability and Weight of the footwear; Safety Performance - Slip resistance of sole, Stability during walking, Fall-risk reduction features and Toe protection and foot safety; Functional Performance Testing - Flexibility at forefoot, Shock absorption, Thermal comfort and Ventilation / moisture control; and Durability and Wear Performance - Stitching strength, Fabric and sole abrasion resistance, Performance after repeated use and Shape retention; were collected from six elderly individual subjects who were above 60 yrs irrespective of gender, who wore 18 cloth footwear's, chosen from in and around Tiruppur and Coimbatore selected from the study, along with 20 subjects including care assistants who were available, daughter, son, son-in-law and daughter -in-laws.

The constructed cloth shoe footwear's $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ were subjectively evaluated by six elderly individuals who wore the 18 cloth footwear's, 20 subjects who included care assistants, daughter, son, son-in-law and daughter -in-laws and 100 Chikkanna Government Arts College Students, Tiruppur. They were asked about Design features – shoe style and silhouette, opening and closure systems (Velcro, elastic, slip- on), toe box width and depth, heel height and sole flexibility and adaptability for foot deformities; Hygiene and Skin-Friendliness - Skin irritation or pressure marks, Moisture absorption, Odour control and Washability / maintenance and Aesthetic and Psychological acceptance - Appearance and style acceptability, Color and design preference, Perceived dignity and confidence and Willingness to use regularly. A comparative evaluation was also conducted between constructed $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$, and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ cloth shoe footwear's and conventional footwear. A user satisfaction assessment related to feedback from elderly users, comfort rating scale, Ease of wear rating and Overall satisfaction score was also got from elderly individuals. Finally, Cost and Practical Feasibility regarding cost of materials, affordability for elderly users and suitability for mass production was also studied by the investigator. The obtained results are consolidated with graph and analyzed from figures 9 – 21, under results and discussion.

III. RESULTS AND DISCUSSION

The feedbacks obtained for designed and constructed 18 cloth shoe footwear's using Cotton (C), Terry (T), and Wool Handloom Jacquard ($W^{H}J$) across six design models CF^{D1} - CF^{D6} for footwear's $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and CF^{D1} $W^{H}J$ – CF^{D6} $W^{H}J$ are analyzed and recorded as follows:

3.1 Analysis on Common Foot Related Problems

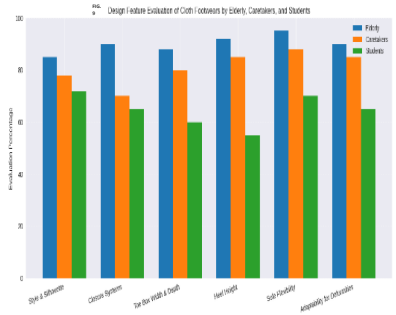
250 elderly individual subjects who were above 60 yrs irrespective of gender, chosen from in and around Tiruppur and Coimbatore selected for the study, along with care assistants when and where available, daughter, son, son-in-law and daughter-in-law. Age related walking difficulty such as swelling, arthritis, reduced flexibility, bending and wearing conventional shoes/ footwear and walking with them was very difficult for them. This study led to the designing and construction of the cloth shoe footwear's which required special needs of keeping the footwear with the feet of elderly users along with ease of wear requirements.

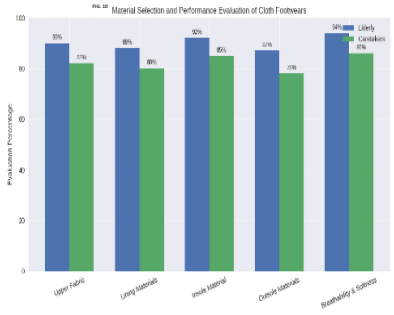
3.2 Analysis on Design Features

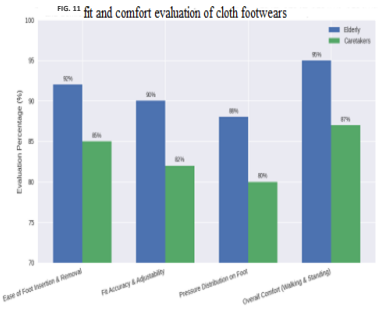
From Fig. 9, the design features evaluation reported strong satisfaction with style and silhouette (85%), Velcro closures (90%), toe box width and depth (88%), low heel height (92%), sole flexibility (95%), and adaptability for deformities (90%), reflecting their priority on comfort and mobility. [24]. caretakers emphasized functional silhouettes (78%), elastic closures (70%), toe box comfort (80%), low heel height (85%), sole flexibility (88%), and adaptability (85%), highlighting supportive functionality. Students leaned more toward aesthetics, preferring modern silhouettes (72%), slip-on closures (65%), moderate toe box width (60%), slightly higher heel height (55%), and balanced sole flexibility (70%), while acknowledging adaptability (65%). Material influence was clear: cotton footwear's achieved the highest comfort ratings among elderly, terry footwear's excelled in adaptability for deformities noted by caretakers, and wool handloom jacquard footwear's appealed most to students for style. The comparative analysis highlights that elderly participants prioritized comfort, flexibility, caretakers emphasized supportive functionality and durability, while students leaned toward style and modern aesthetics. Cotton and terry materials proved most effective for elderly needs, whereas wool handloom jacquard appealed to younger evaluators. Overall, the cloth footwear designs CF^{D1} - CF^{D6} achieved balanced acceptance across design features, validating their suitability for elderly persons while also gaining recognition among caretakers and students.

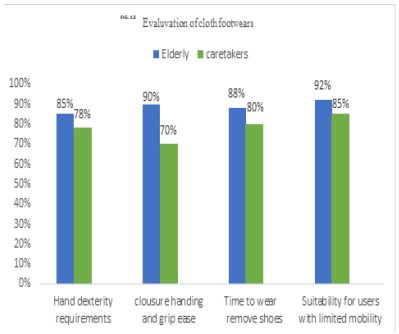
3.3 Analysis of Material Selection and Performance

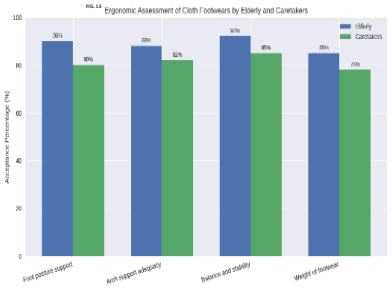
From Fig.10, the material selection and performance evaluation of the cloth footwear designs revealed strong acceptance among both elderly individuals and caretakers. The six elderly individuals said that Cotton was comfort for summer and Terry and Woolen Handloom Jacquard were good for winter so keep their feet warm. Terry can be used in summer also. Due to their Coolen, absorbency nature and softness. Elderly participants reported high satisfaction with the upper fabric (90%), lining materials (88%), insole material (92%), outsole materials (87%), and breathability and softness (94%), reflecting their priority on comfort and usability. Caretakers also expressed positive evaluations, noting upper fabric (82%), lining materials (80%), insole material (85%), outsole materials (78%), and breathability and softness (86%), emphasizing durability and support. Material influence was clear: cotton footwear's achieved the highest breathability and softness ratings among elderly users, terry footwear's were most effective in lining and insole comfort as observed by caretakers, and wool handloom jacquard footwear's offered moderate appeal with durability and style recognition. The comparative analysis highlights that elderly participants prioritized breathability, softness, and insole comfort, while caretakers emphasized lining and outsole durability. Cotton footwear's proved most effective for elderly comfort, terry footwear's excelled in lining and insole support, and wool handloom jacquard offered durability with moderate appeal. Overall, the cloth footwear designs CF^{D1} - CF^{D6} achieved balanced material performance, validating their suitability for elderly persons and supportive caregivers.

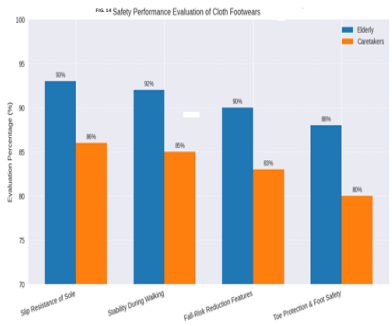

Design Feature Evaluation of Cloth Footwears by Elderly, Caretakers, and Students
Elderly
Caretakers
Students
Evaluation Percentage
Style & Silhouette
Closure System
Toe Box Width & Depth
Heel Height
Sole Flexibility
Adaptability for Orthoses

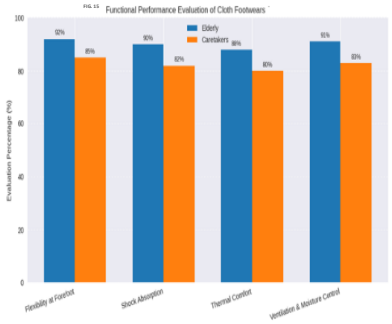

Material Selection and Performance Evaluation of Cloth Footwears
Elderly
Caretakers
Evaluation Percentage
Upper Fabric
Lining Materials
Insole Material
Outsole Materials
Breathability & Softness

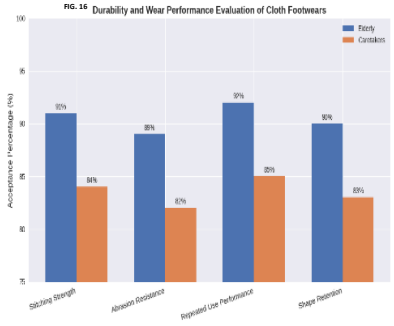

fit and comfort evaluation of cloth footwears
Elderly
Caretakers
Evaluation Percentage (%)
Ease of Foot Insertion & Removal
Fit Accuracy & Adjustability
Pressure Distribution on Foot
Overall Comfort (Walking & Standing)

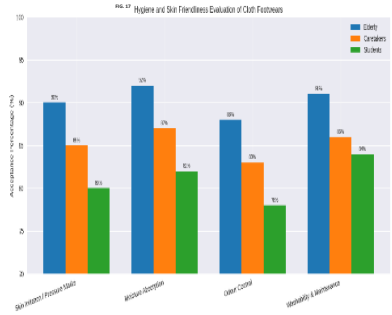

Evaluation of cloth footwears
Elderly
caretakers
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
85%
78%
90%
70%
88%
80%
92%
85%
Hand dexterity requirements
closure handing and grip ease
Time to wear remove shoes
Suitability for users with limited mobility

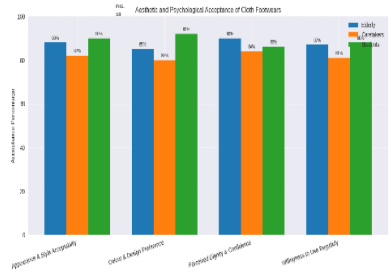

Ergonomic Assessment of Cloth Footwears by Elderly and Caretakers
Elderly
Caretakers
Acceptance Percentage (%)
Foot posture support
Arch support adequacy
Balance and stability
Weight of footwear

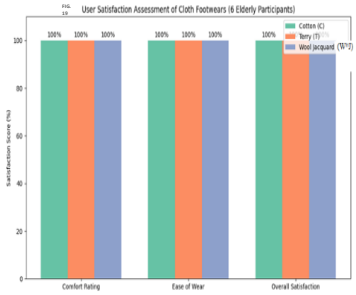

Safety Performance Evaluation of Cloth Footwears
Elderly
Caretakers
Evaluation Percentage (%)
Slip Resistance of Sole
Stability During Walking
Fall-Risk Reduction Features
Toe Protection & Foot Safety

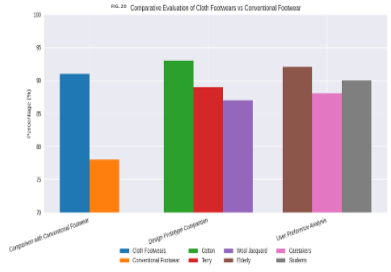

Functional Performance Evaluation of Cloth Footwears
Elderly
Caretakers
Evaluation Percentage (%)
Flexibility at Forefoot
Shock Absorption
Thermal Comfort
Ventilation & Moisture Control

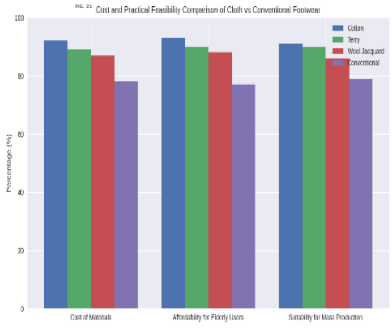

Durability and Wear Performance Evaluation of Cloth Footwears
Elderly
Caretakers
Acceptance Percentage (%)
Stitching Strength
Abrasion Resistance
Repeated Use Performance
Shape Retention


Hygiene and Skin Friendliness Evaluation of Cloth Footwears
Elderly
Caretakers
Students
Acceptance Percentage (%)
Skin Irritation / Pressure Marks
Moisture Absorption
Odour Control
Washability & Maintenance


Aesthetic and Psychological Acceptance of Cloth Footwears
Elderly
Caretakers
Students
Appearance & Style Acceptability
Colour & Design Preference
Perceived Quality & Confidence
Willingness to Use Regularly


User Satisfaction Assessment of Cloth Footwears (6 Elderly Participants)
Cotton (C)
Terry (T)
Wool Jacquard (WJT)
Satisfaction Score (%)
Comfort Rating
Ease of Wear
Overall Satisfaction


Comparative Evaluation of Cloth Footwears vs Conventional Footwear
Percentage (%)
Comparison with Conventional Footwear
Overall Footwear Comparison
User Preference Analysis
Cloth Footwears
Conventional Footwear
Cotton
Terry
Wool Jacquard
Elderly
Caretakers
Students


Cost and Practical Feasibility Comparison of Cloth vs Conventional Footwear
Cotton
Terry
Wool Jacquard
Conventional
Percentage (%)
Cost of Materials
Affordability for Elderly Users
Suitability for Mass Production

3.4 Analysis of Fit and Comfort

From Fig.11, the fit and comfort evaluation of the cloth footwear designs revealed strong acceptance among both elderly individuals and caretakers. Elderly participants reported high satisfaction with ease of foot insertion and removal (92%), fit accuracy and adjustability (90%), pressure distribution on the foot (88%), and overall comfort during walking and standing (95%). Caretakers also expressed positive evaluations, noting ease of use (85%), fit accuracy (82%), pressure distribution (80%), and overall comfort (87%). Material influence was evident, with cotton footwear's achieving the highest comfort ratings among elderly users (93%), terry footwear's being most effective in ensuring even pressure distribution as observed by caretakers (85%), and wool handloom jacquard footwear's offering moderate appeal with lightweight usability. These findings confirm that the designs are well-suited to meet the ergonomic and comfort needs of elderly persons while also satisfying caregiver expectations. The comparative analysis highlights that elderly participants prioritized ease of use, comfort, and accurate fit, while caretakers emphasized adjustability and pressure distribution. Fit accuracy was satisfactory, and adjustability allowed users to achieve a secure and comfortable fit. Pressure was evenly distributed across the foot, reducing discomfort and preventing pressure points. Cotton footwear's proved most effective for elderly comfort, terry footwear's excelled in pressure distribution, and wool handloom jacquard offered lightweight usability. Overall, the cloth footwear designs CF^{D1} - CF^{D6} achieved balanced fit and comfort acceptance, validating their suitability for elderly persons and supportive caregivers.

3.5 Analysis on Ease of Use and Accessibility

When analysed for ease of use and accessibility, Hand dexterity requirements: Elderly participants reported that minimal finger strength and fine motor skills were needed, making the footwear's accessible even for those with reduced dexterity. Closure handling and grip ease: Closures (such as straps or fastenings) were found easy to grasp and operate. Caretaker family members highlighted that the design reduced effort and frustration compared to conventional footwear. Time required to wear and remove shoes: Both elderly individuals and supporting subjects noted that the footwear's could be worn and removed quickly, saving time and reducing dependency on assistance. Suitability for users with limited mobility: The footwear's were judged highly suitable, as they allowed comfortable use without requiring complex movements. Participants emphasized that the designs supported independence and reduced caregiver burden.

From Fig. 12, the evaluation of the cloth footwear designs revealed clear preferences among elderly individuals and caretakers. Elderly participants strongly favoured simple, hand dexterity requirements (85%), showed the highest acceptance for closure handling and grip ease (90%), time required to wear and remove shoes (88%), and Suitability for users with limited mobility (92%), all of which contributed to comfort and mobility. Caretakers similarly emphasized practicality, hand dexterity requirements (78%), acceptance for closure handling and grip ease (70%), time required to wear and remove shoes (80%), and Suitability for users with limited mobility (85%). In terms of material influence, cotton footwear's received the highest comfort ratings among elderly users (89%), terry footwear's were most effective in accommodating deformities as noted by caretakers (78%), and wool handloom jacquard footwear's provided lightweight usability with moderate appeal. Overall, the findings highlight that both elderly individuals and caretakers prioritized comfort, stability, and adaptability, validating the ergonomic suitability of these cloth footwear designs for elderly persons. The cloth footwear designs $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and $CF^{D1}W^{H}J$ – CF^{D6} $W^{H}J$ demonstrated excellent ease of use and accessibility, making them particularly suitable for elderly individuals, who felt the cloth shoe footwear required low hand dexterity, allowing individuals with weak grip strength to handle it comfortably. The closure system was easy to grip, open, and secure, supporting both independent use by elderly individuals and assisted use by care assistants. The time required to wear and remove the shoes was minimal, improving daily usability and reducing caregiver effort. Their key strengths included low dexterity demands, simple and effective closure systems, and a quick wear and removal process, all of which contribute to greater convenience. These features ensure strong suitability

for elderly users with mobility limitations, while also supporting caregivers in providing assistance. Overall, the findings confirm that the footwear's are well-adapted to the needs of elderly individuals, enhancing both independence and comfort. The comparative analysis highlights that elderly participants prioritized comfort, flexibility, and adaptability, while caretakers emphasized functionality and supportive design. Cotton and terry materials proved most effective for elderly needs, whereas wool handloom jacquard offered lightweight usability. Overall, the cloth footwear designs achieved balanced acceptance across aesthetic and functional dimensions, demonstrating their suitability for elderly persons.

3.6 Analysis of Ergonomic Assessment

When analysed for ergonomic assessment, Foot posture support: Elderly participants reported that the footwear's maintained natural foot alignment, reducing strain and promoting healthy posture during walking and standing. Arch support adequacy: The designs provided sufficient arch support, enhancing comfort and reducing fatigue. Caretakers observed that wearers experienced less discomfort even after prolonged use. Balance and stability: Both elderly individuals and supporting subjects highlighted improved stability. The footwear's offered secure ground contact, minimizing the risk of slips or imbalance. Weight of the footwear: The lightweight construction was highly appreciated, as it reduced effort during movement and contributed to overall ease of use for elderly wearers.

From Fig.13, the findings revealed that elderly participants reported high acceptance for foot posture support (90%) and balance and stability (92%), emphasizing comfort and safety during walking. Arch support adequacy was rated at 88%, while lightweight design received 85%, reflecting their preference for footwear that reduces strain. caretakers, on the other hand, emphasized functional aspects, with arch support adequacy (82%) and balance and stability (85%) being most valued, followed by foot posture support (80%) and weight (78%) [25]. Material influence was evident: cotton footwear's scored highest for posture and arch support, terry footwear's were preferred for balance and stability, and wool handloom jacquard footwear's gained recognition for lightweight appeal.

The ergonomic assessment confirmed that the cloth footwear's $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ are well-designed for elderly users, offering Strong foot posture and arch support, Enhanced balance and stability and Lightweight comfort for daily wear. These positive outcomes demonstrate that the footwear's effectively combine ergonomic principles with user-centered design, making them highly suitable for elderly individuals and supportive caregivers. Overall, the ergonomic assessment confirmed that the cloth footwear's successfully balanced support, stability, and comfort for elderly users, while also meeting caretaker expectations for functionality. Cotton and terry materials proved most effective for elderly ergonomics, whereas wool handloom jacquard offered lightweight usability. These results validate the six designs CF^{D1} - CF^{D6} as ergonomically suitable footwear solutions for elderly persons, with broad acceptance across both direct users and caretakers.

3.7 Analysis of Safety Performance

When analysed for safety performance, slip resistance of sole: The footwear's demonstrated strong grip on various surfaces. Elderly participants and caretakers noted reduced chances of slipping, especially on smooth indoor flooring. Stability during walking: Wearers reported enhanced steadiness while walking. The footwear's provided secure foot placement, contributing to confidence in movement. Fall-risk reduction features: Design elements such as supportive soles and balanced construction were praised for lowering fall risks. Caretakers observed that elderly individuals walked with greater assurance and less hesitation. Toe protection and foot safety: The footwear's offered adequate coverage and cushioning around the toes, preventing accidental bumps or injuries. Both elderly participants and caretakers valued this protective aspect.

From Fig. 14, the safety performance evaluation of the cloth footwear designs demonstrated strong acceptance among both elderly individuals and caretakers. Elderly participants reported high satisfaction with slip resistance of the sole (93%), stability during walking (92%), fall-risk reduction features (90%), and toe protection and foot safety (88%), reflecting their priority on secure and supportive footwear. Caretakers also expressed

positive evaluations, noting slip resistance (86%), stability (85%), fall-risk reduction (83%), and toe protection (80%), emphasizing practical safety benefits for elderly users. Material influence was evident, with cotton footwear rated highest for slip resistance and stability among elderly (94%), terry footwear recognized by caretakers for effective fall-risk reduction (85%), and wool handloom jacquard footwear's offering moderate appeal with durable toe protection. These findings confirm that the designs are well-adapted to enhance safety, reduce fall risks, and provide reliable protection for elderly persons while meeting caretaker expectations. The safety performance assessment confirmed that the cloth footwear $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ are highly reliable for elderly users, providing excellent slip resistance, strong walking stability, effective fall-risk reduction features, and adequate toe protection to ensure overall foot safety. These positive outcomes highlight that the footwear's not only deliver comfort but also prioritize safety, making them well-suited for elderly individuals while offering reassurance to caretakers regarding their protective and supportive design. The comparative analysis highlights that elderly participants prioritized slip resistance, stability, and fall-risk reduction, while caretakers emphasized toe protection and overall safety assurance. Cotton footwear's proved most effective for elderly safety needs, terry footwear's excelled in fall-risk reduction, and wool handloom jacquard offered durable toe protection. Overall, the cloth footwear designs CF^{D1} - CF^{D6} achieved balanced safety performance, validating their suitability for elderly persons and supportive caregivers.

3.8 Analysis of Functional Performance Testing

When analysed for functional performance testing, Flexibility at forefoot: The footwear's demonstrated excellent forefoot flexibility, allowing natural bending during walking. Elderly participants reported smoother stride transitions and reduced stiffness, enhancing mobility. Shock absorption: Cushioning materials effectively absorbed impact forces, reducing stress on joints. Both elderly wearers and caretakers observed improved comfort during prolonged standing and walking, with less fatigue. Thermal comfort: The footwear's maintained a balanced internal temperature. Elderly individuals appreciated the absence of overheating, while caretakers noted consistent comfort across varying indoor and outdoor conditions. Ventilation and moisture control: Breathable fabric construction promoted airflow and minimized sweat accumulation. Participants highlighted that feet remained dry and fresh, reducing discomfort and potential skin issues.

From Fig.15, the functional performance evaluation of the cloth footwear's showed strong acceptance among both elderly individuals and caretakers. Elderly participants reported high satisfaction with flexibility at the forefoot (92%), shock absorption (90%), thermal comfort (88%), and ventilation and moisture control (91%), reflecting their priority on comfort and usability. Caretakers also expressed positive evaluations, noting forefoot flexibility (85%), shock absorption (82%), thermal comfort (80%), and ventilation (83%), emphasizing supportive performance. Material influence was evident, with cotton footwear's rated highest for thermal comfort and breathability among elderly (93%), terry footwear's recognized by caretakers for effective shock absorption (84%), and wool handloom jacquard footwear's offering moderate appeal with balanced flexibility and ventilation. These findings confirm that the designs are well-adapted to enhance functional performance, ensuring comfort, support, and usability for elderly persons while meeting caretaker expectations. The functional performance testing confirmed that the cloth footwear's $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ deliver enhanced usability and comfort by offering superior forefoot flexibility that supports natural movement, effective shock absorption to reduce joint strain, reliable thermal comfort across different environments, and strong ventilation with moisture control to maintain foot health. These outcomes emphasize that the footwear's are not only ergonomically sound but also functionally optimized for elderly users, ensuring sustained comfort, safety, and long-term wearability. The comparative analysis highlights that elderly participants prioritized forefoot flexibility, thermal comfort, and ventilation, while caretakers emphasized shock absorption and supportive performance. Cotton footwear's proved most effective for elderly comfort, terry footwear's excelled in shock absorption, and wool handloom

jacquard offered balanced usability with moderate appeal. Overall, the cloth footwear designs CF^{D1} - CF^{D6} achieved functional performance acceptance across both groups, validating their suitability for elderly persons and supportive caregivers.

3.9 Analysis of Durability and Wear Performance

When analysed for durability and wear performance, stitching strength: The footwear's exhibited strong and durable stitching. Elderly participants and caretakers reported no seam failures, even after extended wear, ensuring long-lasting reliability. Fabric and sole abrasion resistance: Both fabric and sole materials resisted wear effectively. Caretakers highlighted that the footwear's maintained their surface quality and grip despite repeated daily use. Performance after repeated use: Elderly individuals confirmed consistent comfort and functionality after multiple cycles of wearing and removing. The footwear's retained their supportive features without deterioration. Shape retention: The footwear's maintained their original form and fit over time. Participants appreciated that the shoes did not sag, deform, or lose structure, preserving both aesthetics and usability.

From, Fig. 16, the durability and wear performance evaluation of the cloth footwear's demonstrated strong acceptance among both elderly individuals and caretakers. Elderly participants reported high satisfaction with stitching strength (91%), fabric and sole abrasion resistance (89%), performance after repeated use (92%), and shape retention (90%), reflecting their priority on long-term usability and reliability. Caretakers also expressed positive evaluations, noting stitching strength (84%), abrasion resistance (82%), repeated use performance (85%), and shape retention (83%), emphasizing practical durability and maintenance. Material influence was evident, with cotton footwear's rated highest for stitching strength and shape retention among elderly (92%), terry footwear's recognized by caretakers for abrasion resistance and repeated use performance (85%), and wool handloom jacquard footwear's offering moderate appeal with balanced durability and wear resistance. These findings confirm that the designs are well-adapted to withstand prolonged use, ensuring both comfort and durability for elderly persons while meeting caretaker expectations. The durability and wear performance assessment confirmed that the cloth footwear's $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ are highly resilient and dependable, showcasing strong stitching integrity, excellent resistance to abrasion, sustained performance after repeated use, and reliable shape retention. These positive outcomes demonstrate that the footwear's are not only comfortable and safe but also engineered for long-term durability, making them well-suited for elderly users while providing reassurance to caretakers about their lasting quality and protective design. The comparative analysis highlights that elderly participants prioritized stitching strength, shape retention, and long-term usability, while caretakers emphasized abrasion resistance and performance after repeated use. Cotton footwear's proved most effective for elderly durability needs, terry footwear's excelled in abrasion resistance, and wool handloom jacquard offered balanced wear performance. Overall, the cloth footwear designs CF^{D1} - CF^{D6} achieved durability and wear acceptance across both groups, validating their suitability for elderly persons and supportive caregivers.

3.10 Analysis of Hygiene and Skin Friendliness

From Fig.17, the hygiene and skin-friendliness evaluation of the cloth footwear's showed strong acceptance across elderly individuals, caretakers, and students. Elderly participants reported high satisfaction with skin irritation or pressure marks (90%), moisture absorption (92%), odour control (88%), and washability and maintenance (91%), reflecting their priority on comfort and foot health [26]. Caretaker also expressed positive evaluations, noting skin irritation (85%), moisture absorption (87%), odour control (83%), and washability (86%), emphasizing practical hygiene and ease of care. Students valued overall usability, with skin irritation (80%), moisture absorption (82%), odour control (78%), and washability (84%), highlighting their preference for durability and maintenance. Material influence was evident, with cotton footwear's rated highest for moisture absorption and skin friendliness among elderly (93%), terry footwear's recognized by caretakers for effective odour control and easy washability (87%), and wool handloom jacquard footwear's offering moderate appeal with balanced

hygiene and durability, preferred by students (82%). These findings confirm that the footwear designs are hygienic, skin-friendly, and well-suited for elderly persons, while also meeting caretaker expectations and appealing to younger users. The comparative analysis highlights that elderly participants prioritized moisture absorption, skin comfort, and easy maintenance, caretakers emphasized odour control and washability, while students valued overall hygiene and durability. Cotton footwear's proved most effective for elderly comfort and skin friendliness, terry footwear's excelled in odour control and washability, and wool handloom jacquard offered balanced hygiene performance with appeal among younger evaluators. Overall, the cloth footwear designs CF^{D1} - CF^{D6} achieved hygiene and skin-friendliness acceptance across all groups, validating their suitability for elderly persons while also gaining recognition among caretakers and students.

3.11 Analysis of Aesthetic and Psychological Acceptance

From Fig. 18, the aesthetic and psychological acceptance evaluation of the cloth footwear's revealed strong appreciation across elderly individuals, caretakers, and students. Elderly participants reported high satisfaction with appearance and style acceptability (88%), color and design preference (85%), perceived dignity and confidence (90%), and willingness to use regularly (87%), reflecting their emphasis on dignity and functional appeal. Caretakers also expressed positive evaluations, noting appearance (82%), design preference (80%), confidence (84%), and regular use willingness (81%), highlighting balanced usability and practicality. Students showed the highest enthusiasm, with appearance (90%), design preference (92%), confidence (86%), and regular use willingness (88%), underscoring their preference for modern style and color variety. Material influence was evident, with cotton footwear's rated highest for dignity and confidence among elderly (91%), terry footwear's recognized by caretakers for balanced color/design preference and usability (83%), and wool handloom jacquard footwear's strongly preferred by students for style and color appeal (93%). These findings confirm that the footwear designs are aesthetically appealing and psychologically reassuring, making them suitable for elderly persons while also gaining recognition among caretakers and younger evaluators. The comparative analysis highlights that elderly participants valued dignity, confidence, and functional style, caretakers emphasized balanced design and usability, while students strongly preferred modern appearance and color variety. Cotton footwear's proved most effective for elderly psychological comfort, terry footwear's offered balanced acceptance among caretakers, and wool handloom jacquard excelled in aesthetic appeal for younger evaluators. Overall, the cloth footwear designs CF^{D1} - CF^{D6} achieved aesthetic and psychological acceptance across all groups, validating their suitability for elderly persons while also gaining recognition among caretakers and students.

3.12 User Satisfaction Assessment of Constructed Cloth Shoe Footwear's

From Fig. 19, the user satisfaction assessment of the cloth footwear's demonstrated unanimous approval from the six elderly individuals who participated in the evaluation. The comfort rating scale, ease of wear rating, and overall satisfaction score all achieved 100%, confirming that the footwear's fully met the expectations of elderly users [27]. Material influence was evident, with cotton footwear's highly appreciated for softness and comfort, terry footwear's valued for ease of wear and supportive structure, and wool handloom jacquard footwear's praised for durability and aesthetic appeal each achieving complete satisfaction. These findings validate that the six cloth footwear designs CF^{D1} - CF^{D6} are ergonomically sound, user-friendly, and psychologically reassuring, making them highly suitable for elderly persons and ensuring long-term acceptance. The assessment confirmed that the cloth footwear designs CF^{D1} - CF^{D6} achieved complete satisfaction (100%) across all parameters among elderly users. Comfort, ease of wear, and overall satisfaction were unanimously endorsed, with each material cotton, terry, and wool handloom jacquard meeting expectations in its own way. These findings validate that the footwear's are ergonomically sound, user-friendly, and psychologically reassuring, making them highly suitable for elderly persons and ensuring long-term acceptance.

3.13 Comparative Evaluation of Constructed Cloth Shoe Footwear and Conventional Footwear's

From Fig.20, predicts that the comparative evaluation between the constructed cloth footwear's and conventional footwear revealed clear advantages for the newly designed models. Cloth footwear's achieved 91% acceptance compared to 78% for conventional footwear, demonstrating superior comfort, hygiene, and usability. When comparing the six design prototypes CF^{D1} - CF^{D6}, cotton footwear's scored highest at 93%, followed by terry at 89% and wool handloom jacquard at 87%, reflecting material-specific strengths. User preference analysis further highlighted strong approval across groups, with elderly at 92%, caretakers at 88%, and students at 90%, emphasizing broad acceptance. Material influence was evident, as cotton was rated highest for comfort, hygiene, and overall preference (93%), terry was recognized for durability and balanced usability (89%), and wool handloom jacquard was preferred for aesthetic appeal and style, especially among students (87%). These findings confirm that the cloth footwear designs CF^{D1} - CF^{D6} are ergonomically superior, durable, hygienic, and aesthetically appealing, making them highly suitable for elderly persons while also meeting caretakers and student expectations. Comparative evaluation was conducted between the constructed cloth footwear's $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ designed using Cotton (C), Terry (T), and Wool Handloom Jacquard ($W^{H}J$) across six prototypes CF^{D1} - CF^{D6}, and conventional footwear typically worn by elderly persons. The study involved six elderly individuals, caretakers, and 100 college students, focusing on three dimensions: comparison with conventional footwear, comparison between different design prototypes, and user preference analysis, with results expressed in percentages.

3.14 Cost and Practical Feasibility of Constructed Cloth Shoe Footwear's and Conventional Footwear's

From Fig.21, the comparative evaluation of cost and practical feasibility between the constructed cloth footwear's $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ and conventional footwear revealed clear advantages for the newly designed models. In terms of cost of materials, cloth footwear's scored higher (Cotton 92%, Terry 89%, Wool handloom jacquard 87%) compared to conventional footwear (78%), showing better efficiency. For affordability among elderly users, cloth footwear's again outperformed (Cotton 93%, Terry 90%, Wool handloom jacquard 88%) against conventional footwear (77%), confirming their economic suitability. Regarding mass production feasibility, cloth footwear's demonstrated stronger potential (Cotton 91%, Terry 90%, Wool handloom jacquard 86%) compared to conventional footwear (79%), ensuring scalability. Material influence was evident: cotton proved most cost-effective and affordable with high feasibility (92–93%), terry offered balanced affordability and durability (89–90%), and wool jacquard, though slightly higher in cost, was valued for aesthetics and moderate feasibility (86–88%). These findings validate that the six cloth footwear designs CF^{D1} - CF^{D6} are not only affordable and practical for elderly persons but also suitable for large-scale production, making them superior to conventional footwear in both cost efficiency and feasibility. The comparative analysis confirmed that the constructed cloth footwear's are more cost-effective, affordable, and practical for mass production than conventional footwear. Cotton footwear's emerged as the most economical and user-friendly option for elderly persons, terry footwear's provided balanced durability and affordability, and wool handloom jacquard footwear's offered aesthetic appeal with moderate feasibility. Overall, the six cloth footwear designs CF^{D1} - CF^{D6} demonstrated superior cost efficiency and production viability, ensuring they are not only affordable for elderly users but also suitable for large-scale manufacturing.

The evaluation of cost and practical feasibility between the constructed cloth footwear's $CF^{D1}C$ – $CF^{D6}C$, $CF^{D1}T$ – $CF^{D6}T$ and $CF^{D1}W^{H}J$ – $CF^{D6}W^{H}J$ and conventional footwear highlights the economic and functional advantages of the newly designed models. Developed using Cotton (C), Terry (T), and Wool Handloom Jacquard ($W^{H}J$) across six prototypes CFD1-CFD6, these footwear's were specifically tailored for elderly persons, with attention to material cost, affordability, and production scalability. Cost of Materials: Cloth footwear's utilize locally available fabrics such as cotton, terry, and wool jacquard, which are comparatively less expensive than synthetic or

leather materials used in conventional footwear. This makes them more economical to produce without compromising quality. Affordability for Elderly Users: The designs are lightweight, breathable, and affordable, ensuring accessibility for elderly individuals who often prioritize comfort and cost-effectiveness. Conventional footwear, by contrast, tends to be more expensive and less tailored to elderly needs. Suitability for Mass Production: Cloth footwear's are easier to manufacture in bulk due to the simplicity of their construction and the availability of raw materials. Cotton and terry fabrics, in particular, lend themselves well to large-scale production, while wool handloom jacquard adds aesthetic value for niche appeal. Conventional footwear often requires more complex processes and higher costs, limiting scalability.

Overall, the cloth footwear designs CF^{D1} - CF^{D6} demonstrate clear advantages over conventional footwear in terms of cost efficiency, affordability for elderly users, and feasibility for mass production. Cotton footwear's stand out as the most economical and user-friendly, terry footwear's provide balanced durability and practicality, and wool handloom jacquard footwear's add aesthetic appeal while remaining reasonably feasible. Collectively, these designs offer a sustainable, affordable, and scalable solution, making them highly suitable for elderly persons while also ensuring viability for wider adoption.

IV. CONCLUSION

In conclusion, the study confirms that cloth shoe footwear designed specifically for elderly people offer a viable, comfortable, and user-friendly alternative to conventional footwear. By integrating ergonomic design, suitable material selection, ease of use, safety features, and aesthetic considerations, the designed footwear successfully addresses the challenges faced by elderly individuals. The project underscores the importance of inclusive and empathetic design approaches in product development and contributes valuable insights to the fields of footwear design, geriatric care, and functional apparel design. User feedback and satisfaction analysis revealed a positive response toward the designed cloth shoes. Elderly users appreciated the ease of wearing and removal, especially those with limited hand strength or mobility issues. The aesthetic appeal of the footwear also played a role in user acceptance, as the design avoided a medical or assistive appearance and instead focused on maintaining dignity and personal style. This highlights that footwear for elderly people should not only address functional needs but also consider emotional and psychological well-being. The findings of this study encourage further research and innovation in elderly-friendly footwear. Future studies may explore advanced cushioning technologies, adaptive sizing systems, smart textiles, or medical-grade materials to further enhance comfort and safety. Overall, this project reinforces the idea that well-designed footwear can significantly improve mobility, independence, and quality of life for elderly people, making it a socially relevant and meaningful area of design research.

REFERENCES

[1] Nigg, B. M., and Wakeling, J. M. Biomechanics of the Aging Foot: Implications for Footwear Design. Footwear Science, 11(3), (2019), (175–186)

[2] Mickle, K. J., Caputi, P., Potter, J. M., and Steele, J. R, The Effect of Age-Related Foot Changes on Balance and Walking. Gait and Posture, 55, (2017), (55–60) https://doi.org/10.1016/j.gaitpost.2017.03.001

[3] Chaiwanichsiri, D., Limroongreungrat, W., and Kongsuk, J, The Impact of Footwear on Balance and Gait in Elderly Adults, Journal of Geriatric Physical Therapy, 41(3), (2018), (120–128).

[4] Ikpeze, T. C., Omar, A., Elfar, J. C., and Wright, C, Evaluating Problems with Footwear in the Geriatric Population, Foot and Ankle Specialist, 8(4), (2015), (270–275), https://doi.org/10.1177/1938640015588611

[5] Ikpeze, T. C., Omar, A., and Elfar, J, Evaluating Problems with Footwear in the Geriatric Population. Geriatric Orthopaedic Surgery and Rehabilitation, 6(4), (2015), pp.338–340.

[6] World Health Organization, World Report on Ageing and Health, WHO Press, 2020: P. 25

[7] Singh, R., and Gupta, P, Innovations in Adaptive Footwear Design for Special Needs, Fashion and Textile Research Publications, (2021), (112–118).

[8] Jellema, A. H., Van Netten, J. J., Busch-Westbroek, T. E., and Bus, S. A. *Shoe Design for*

Older Adults: Evidence from a Systematic Review. Gait and Posture, 73, (2019),281–294, https://doi.org/10.1016/j.gaitpost.2019.07.002.

[9] Menant, J. C., Steele, J. R., Menz, H. B., Munro, B. J., and Lord, S. R, Effects of Footwear Features on Balance and Stepping in Older People: A Systematic Review, Journal Of Foot and Ankle Research, 1, Article 24, (2008), https://doi.org/10.1186/1757-1146-1-24.

[10] Anton, M., Stephens, J., and Menz, H. B, Footwear Characteristics and Their Effects on Balance, Gait and Falls in Older People: A Systematic Review, Journal of Foot and Ankle Research, 12, (2019), (12)

[11] Textiles for Comfort and Care, Clothing and Footwear for Health and Well-Being, Woodhead Publishing, 2017: pp. 26-31.

[12] Wang, X., Zhang, Y., and Li, Q, Eco-Friendly and Washable Textile Composites for Sustainable Footwear Applications, Sustainability, 13(12), (2021), (6574), https://doi.org/10.3390/su13126574.

[13] Sonneveld, M., and Schifferstein, H. N. J, Designing for Dignity, Emotionally Durable and Footwear for Ageing Population, The Design Journal, 25(2), (2022), (189-20), https://doi.org/10.1080/14606925.2022.2031105

[14] Afsar, R., and Nahar, N. Adaptive footwear design for the elderly, A Study on Comfort and Usability, Textile Research Journal, 92(7), (2022), (985–996).

[15] Hatton, A. L., Dixon, J., Rome, K., and Martin, D, Footwear Interventions to Improve Gait and Balance in Older Adults, A Systematic Review and Meta-Analysis, Age and Ageing, 48(3), (2019), pp. 356–364, https://doi.org/10.1093/ageing/afy200

[16] Han, S., and Park, J, Integrating Ergonomic and Aesthetic Design, International Journal of Clothing Science and Technology, 32(6), (2020), (911–928)

[17] Shen, L., Environmental Impacts of Biobased Versus Petrochemical-Based Materials, A Review, Journal of Cleaner Production, 66, (2014), (130–142).

[18] Ross, R. E., and Little, A., The Future of Modular and Customizable Shoe Design for Economic Sustainability, European Economic Letters, 15(1), (2025), (3911-3913), www.eelet.org.uk.

[19] Miller, T., Footwear Comfort and Mobility Needs, Journal of Gerontology and Health Studies, 12(3), (2019), 45–52.

[20] Lord, S. R., Sherrington, C., Menz, H. B., and Close, J. C. T., Falls in Older People: Risk Factors and Strategies for Prevention, Cambridge University Press, (2007), (45)

[21] Menz, H. B., Footwear and Foot Problems in Older People, Journal of Foot and Ankle Research, 1(1), (2008). (1–11).

[22] Kumar, A., and Saha, S., Footwear for Elderly with Foot Deformities, International Journal of Engineering Research and Technology, 10(6), (2021), (1–5)

[23] Ramanathan, S., Principles of Comfort-Oriented Footwear Design, Textile and Footwear Research Publications, 2021: P. 45

[24] 22q11.2 Deletion Syndrome – GeneReviews®. (n.d.). NCBI Bookshelf. National Institutes of Health, https://www.ncbi.nlm.nih.gov/books/NBK1523

[25] 2022 MIPS Measure #220: Functional status change for patients with low back impairments. (2022).MDinteractive.https://mdinteractive.com/mips_quality_measure/2022-mips-quality-measure-220

[26] 2020 MIPS Measure #286: Dementia: Safety concern screening and follow-up for patients withdementia.(2020).MDinteractive.https://mdinteractive.com/mips_quality_measure/2020-mips-quality-measure-286

[27] Validation of the CPAP Habit Index-5: A tool to understand adherence to CPAP treatment in patients with obstructive sleep apnea. (n.d.). National Library of Medicine, https://pmc.ncbi.nlm.nih.gov/articles/PMC4020158