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Modification of Sewing Machine Foot Pedal to Hand Pedal for People with Disabilities Affecting Both Legs

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ABSTRACT

The situation of people with disabilities, their needs, and the barriers they face to participating fully in their societies is a critical issue. People with disabilities require the same essentials as those without disabilities. However, they often struggle to meet their needs due to difficulties in moving freely from place to place and the challenges of securing employment. Additionally, societal expectations often perceive individuals with disabilities as dependent and unable to fulfill their needs and wants through their own efforts. Therefore, modifying sewing machines presents an excellent opportunity for individuals with disabilities, particularly those with disabilities affecting both legs. Typically, sewing machines are operated by foot, and sewing work can be performed while sitting in one place, eliminating the need for movement. This project aims to alter both governmental and societal perceptions by modifying sewing machines to be hand-operated, thus enabling individuals with disabilities to work independently. By adapting the lower part of the sewing machine, which is typically foot-operated, to be hand-operated, people with disabilities can become self-sufficient. This change will help shift their status from dependent to independent, demonstrating that individuals with disabilities can contribute to society equally in terms of work, lifestyle, and meeting their needs and wants.

Keywords: *Disability, modification, sewing, machine*

INTRODUCTION

Physical disability indicates any physical limitations or disabilities that inhibit the function of one or more limbs of a person. These disabilities can be temporary or permanent and can arise from various causes, such as accidents, injuries, illnesses, post-surgery effects, and hereditary factors.

Mobility impairment includes upper or lower limb loss or impairment, poor manual dexterity, and damage to one or multiple organs. Mobility disabilities can be congenital, acquired, or a result of disease. Individuals with a broken skeletal structure also fall into this category.

Barriers and Inclusion: Persons with disabilities face significant barriers to participating as equal members of society worldwide. In developing countries like Ethiopia, these barriers have largely excluded them from mainstream society, making it difficult to access community resources. Despite international recognition and the adoption of various instruments to improve their status, this segment of society continues to face numerous challenges. Nationally, progressive measures have been adopted by development actors, including the government, to establish a more inclusive society. However, much remains to be done to effectively address these challenges. Strengthened and more effective disability interventions are imperative.

Disability and Development: The issue of disability has gained increased prominence in development discourse in Ethiopia. Globally, disability is interlinked with poverty and is considered integral to achieving the Millennium Development Goals, to which the Ethiopian Government is committed. In June 2010, the Ethiopian Government adopted various disability-specific measures, including the ratification/accession to the landmark 2006 UN Convention on the Rights and Dignity of Persons with Disabilities. Non-governmental organizations (NGOs) in Ethiopia are increasingly mainstreaming disability issues in their work. However, the prominence of disability in the country's development efforts is still insufficient compared to the number of people affected.

Definition and Scope of Disability: Disability can be cognitive, developmental, intellectual, mental, physical, sensory, or a combination of these. It substantially affects a person's life activities and can be present from birth or occur during a person's lifetime. Disability is part of the human condition; almost everyone will be temporarily or permanently impaired at some point in life. Many extended families have a disabled member, and many non-disabled people support and care for their relatives and friends with disabilities.

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A physical disability can result from bodily injury, illness, or birth defects, including but not limited to paralysis, diabetes mellitus, epilepsy, amputation, lack of physical coordination, blindness, deafness, muteness, or reliance on assistive devices such as guide dogs, wheelchairs, canes, or crutches. Physical disabilities should not be confused with intellectual disabilities; individuals with physical disabilities may have problems with diction, but their intellectual capacity remains unaffected.

Varieties and Conditions: Physical disability varies according to the type and intensity of mobility loss. People with physical disabilities experience a reduction in motor skills, which are based on a complex body structure including the nervous system, spinal cord, muscles, nerves, and joints. Disabilities can affect muscular, neurological, or skeletal systems.

Conditions associated with physical disabilities include amputation, cerebral palsy, congenital conditions, epilepsy, Friedreich's ataxia, head injury, juvenile rheumatoid arthritis, multiple sclerosis, muscular dystrophy, paraplegia/quadriplegia, scoliosis, and spina bifida. Some individuals with physical disabilities use mobility devices such as prostheses, orthoses, canes, wheelchairs, crutches, or walkers.

Accessibility and Safety: For people with physical disabilities, accessibility and safety are primary concerns. Access to public areas such as city streets, sidewalks, ramps, elevators, public buildings, and restrooms are common issues that need to be addressed to improve their participation and inclusion in society.

Classifications of Disabilities

Disabilities encompass various physical and mental impairments that can hinder or reduce a person's ability to perform day-to-day activities. These impairments can be categorized into several broad sub-categories, including the following eight main types of disabilities:

1. Mobility and Physical Impairments: This category includes individuals with different types of physical disabilities, such as:

- Upper limb(s) disability
- Lower limb(s) disability
- Manual dexterity issues
- Disabilities affecting coordination with different organs of the body

Mobility impairments can be congenital, acquired with age, or result from disease. Individuals with broken bones also fall into this category.

2. Spinal Cord Disability: Spinal cord injuries can sometimes lead to lifelong disabilities, usually resulting from severe accidents. Injuries can be:

- Incomplete: Messages conveyed by the spinal cord are not completely lost.
- Complete: Total dysfunction of the sensory organs.

3. Head Injuries - Brain Disability: Brain disabilities occur due to brain injuries, which can range in severity from mild to severe.

4. Vision Disability: Many people have varying degrees of vision impairment, which can lead to serious conditions like blindness or ocular trauma. Common vision impairments include:

- Scratched cornea
- Scratches on the sclera
- Diabetes-related eye conditions
- Dry eyes
- Corneal graft

5. Hearing Disability: Hearing disabilities range from partial to complete deafness. Those who are partially deaf often use hearing aids. Deafness can be congenital or acquired, for instance, through meningitis, which can damage the auditory nerve or cochlea. Deaf individuals use sign language for communication, with hundreds of sign languages in use worldwide.

6. Psychological Disorders: These include affective disorders, which affect mood or feeling states, either short-term or long-term. Mental health impairment describes individuals who have experienced psychiatric problems or illnesses.

7. Types of Leg Injuries: Fracture: The medical term for a broken bone, with the tibia being the most commonly broken bone in the leg. Children with fractures cannot bear weight or walk.

- **Dislocation**: Occurs when a bone is pulled out of its joint, with the dislocated kneecap (patella) being common.
- **Sprains**: Stretches and tears of ligaments, such as a sprained ankle, which is usually caused by turning the ankle inward.
- **Strains**: Stretches and tears of muscles, often referred to as pulled muscles.
- **Muscle Overuse**: Muscle pain from overuse without a direct injury, common in sports or exercise, such as shin splints from running.
- **Muscle Bruise**: Caused by a direct blow, resulting in bleeding into the thigh muscles (quads), which is very painful.
- **Bone Bruise**: Resulting from a direct blow, such as a "hip pointer."

8. Other Disabilities: Disability can affect various systems and parts of the body. It may result from conditions such as:

- Amputation
- Cerebral palsy (cerebral motor disorder)
- Congenital conditions
- Epilepsy
- Friedreich's ataxia
- Head injuries
- Juvenile rheumatoid arthritis
- Multiple sclerosis
- Muscular dystrophy
- Paraplegia/quadriplegia
- Scoliosis
- Spina bifida
- Many disabilities involve the use of mobility devices such as prostheses, orthoses, canes, wheelchairs, crutches, or walkers.

Accessibility and Safety

For people with physical disabilities, accessibility and safety are primary concerns. Ensuring access to public areas, including

city streets, sidewalks, ramps, elevators, public buildings, and restrooms, is crucial for their inclusion and participation in society.

Justification & Problem Statement

Creating job opportunities for people with disabilities necessitates a change in societal thinking. Many still believe that disabled individuals cannot work as effectively as non-disabled individuals. However, we aim to demonstrate that disabled persons are capable of performing tasks just as efficiently. For instance, individuals with disabilities affecting both legs can sew garments if the sewing machine's foot pedal is modified to be operated by hand. Providing such job opportunities not only fosters independence but also offers personal satisfaction through meaningful work.

In Ethiopia, physical rehabilitation centres see a high number of individuals with disabilities affecting both legs. These individuals and their families often incur additional costs to maintain a standard of living comparable to that of non-disabled people. Moreover, they are more likely to be unemployed and remain dependent at home for extended periods.

Many disabled individuals lack equal access to employment opportunities, do not receive necessary disability-related services, and face exclusion from everyday activities. Disability is a critical development issue, with increasing evidence showing that disabled individuals experience worse socioeconomic outcomes and higher levels of poverty compared to their non-disabled counterparts.

In many developing countries, both the government and society often view individuals with disabilities as useless, dependent, and non-competitive, believing they lack the ability to work. Our project aims to challenge and change these perceptions by providing practical solutions. Modifying sewing machines to be hand-operated offers a viable employment opportunity for individuals with disabilities affecting both legs, addressing these entrenched biases.

Currently, all types of sewing machines require the use of legs for operation, making them inaccessible to individuals with leg disabilities. Our modified sewing machine, which is fully operated by hand, will be easy to use and specifically designed for those with disabilities affecting both legs. This innovation will transform the lives of these individuals, increasing their productivity and integrating them into the garment industry, where the ability to sit for extended periods is beneficial.

By implementing this project, we aim to open the sewing sector to leg-disabled individuals, proving that they are capable, independent, and valuable contributors to society. This initiative will help shift societal and governmental expectations, demonstrating that people with disabilities can work and thrive in various industries.

Figure 1 two legs disability persons

OBJECTIVES

The objective of this study is to modify the sewing machine foot pedal to a hand pedal for individuals with disabilities affecting both legs.

LITERATURE REVIEW

Disability is part of the human condition that can or could have temporarily or permanently impaired individuals at some point in their lives. Disability should not be considered a challenge to self-enhancement, making important contributions to society, and holding significant positions in all walks of life. It becomes a handicap largely when societal discriminatory attitudes are widespread and opportunities for self-growth and development are non-existent (Seyoum, January 2017).

In both developed and developing countries, people with physical disabilities that limit their mobility (PPDs) face difficulties in their physical environments. PPDs generally have poorer health, lower educational achievements, fewer economic opportunities, and higher rates of poverty than fully-mobile people, due to a lack of access to a range of services. Lack of access to water and sanitation services that are enjoyed and utilized by those without mobility challenges (either temporary or permanent) is a denial of human rights (Azage, 2016).

Physical impairment or mobility problems are age-old phenomena in human societies. They are often associated with various misconceptions and attitudes in different societies. Globally, persons with disabilities have been labeled with terms like "evil spirit," "witchcraft," "ill," and "unfortunate" (Mesele, 2020).

Growing awareness about the employability of persons with disabilities and an acute skill shortage in the garment manufacturing industry has triggered interest in finding manpower among them. Their highly developed alternative senses and training in daily living skills, mobility, use of aids and appliances, social skills, and so on help them adjust to their disability and perform at par with the able-bodied. Thus, in light of the above, efforts were made to develop demand-driven, disability-specific vocational training modules in garment manufacturing processes for the target population, including persons with locomotor, hearing, and visual impairments. Analysis of various tasks performed in different sections of the garment manufacturing units led to job mapping for the target population (Chahal, 2015).

Disability has become a natural part of the human condition due to population ageing, the increase of chronic diseases, and medical advances that preserve and prolong life. Globally, adding life to years has become as important as adding years to life and is now on the agenda of the United Nations' Millennium Development Goals (MDG). According to the World Health Organization (WHO), there are over one billion people estimated to be living with disabilities in the world. Social inclusion and community participation of people with disabilities (PWD) are central concepts guiding current policies for disabled persons around the world. As nations realize, negative attitudes toward disability affect the integration of disabled persons into the community, leading to the loss of a

potential resource. Negative perceptions can lead to a lack of opportunities and work, low self-esteem, and isolation, consequently leading to stigmatization, marginalization, and recurring negative health outcomes that prolong the discomfort of PWDs and create a substantial social burden. Identifying and understanding negative attitudes toward disability can help further define the factors that hinder or foster PWDs' health and social integration, as well as the development and effectiveness of necessary corollary services (Tian, 2016).

The foremost concern for employers is business productivity, which leads them to closely observe employee performance. Moreover, the current high degree of competition and continued technological advances on a global scale have raised business expectations, which in turn are associated with higher performance standards. People tend to evaluate workers with disabilities as being less competent professionally than those without disabilities. These negative evaluations can reduce the likelihood of hiring people with disabilities. However, they are rated more positively in terms of being likeable and socially accepted than for work performance. Therefore, it is reasonable to expect that employer attitudes about the work performance of people with disabilities are more negative than those concerning their potential for social acceptability and quality of social interaction in the workplace (Nota, 2014).

Persons with disabilities (PWDs) encounter daily barriers not only to their participation in society but also in terms of employment. Employment is critical and vital for every individual, including PWDs. Through employment, one can earn a livelihood, enjoy social contacts, and gain self-esteem. Various policies, strategies, and programs have been implemented to increase the participation of PWDs in the workforce. Among the efforts being continuously carried out are the introduction of job coach services, upgrading sheltered employment programs, strategic planning for PWDs, disability equality training, and rehabilitation programs for PWDs, as well as incentives for employed PWDs and hiring organizations. Despite these measures, the participation of PWDs in employment continues to be problematic, complex, controversial, and unsatisfactory. The number of PWDs employed by public or private organizations remains small, and the percentage of unemployed PWDs remains persistently high (Manaf, 2018).

The World Health Organization estimates that globally around 1 billion people (15%) live with some sort of disability; the majority live in resource-limited settings. This number is increasing due to the rise of an ageing population, advancements in medical care, and population growth worldwide. Disability is considered a human rights and global health issue, as well as an agenda for development. People with disabilities face various challenges during their lifetime, including social exclusion, stigma, severe health challenges, and limited access to education and employment. These challenges not only affect individuals but also their societal roles. The difficulties and barriers experienced by people with disabilities are not only due to their health conditions but also to inadequate policies and standards that fail to empower and support them. This is often reflected in negative attitudes, prejudices, and the inaccessibility of services. Disability is also linked with poverty, and people living with disabilities in developing countries face many daily challenges. Disability is caused by several factors, such as poor living conditions, poor nutrition, lack of health and sanitation facilities, various forms of accidents and injuries, congenital malformations, psychological dysfunctions, and birth-related incidents (Mekonnen, 2017).

Challenges of Disabled Persons

According to proponents of the Socio-political Model, many individuals with disabilities report that their greatest difficulties have nothing to do with the disability itself. Rather, their greatest difficulties result from social isolation, prejudice, and discrimination. A disabled person summarized this by stating that society makes people with disabilities foreigners in their own country. The well-defined normative basis of disability in the Biomedical Model also relieves society of any need to provide accommodation. The entire focus is on changing the individual (rehabilitation) rather than changing the environment (accommodation). In the Biomedical Model, disability is thought to be dysfunction, abnormality, pathology, disease, or defect. Simply stated, it is better not to have a disability. Disability is seen as deviance, not a valued difference. Therefore, individuals with a disability understand that they belong to a devalued group, regardless of their individual attributes, achievements, or resources. Often, individuals with disabilities eventually accept the disabled role of inferiority and deviance. Others, like the Deaf Culture, refuse the “disabled role” and consider themselves a cultural group defined by the use of American Sign Language, rather than a disability group (Smart, 2006-2007).

Employment Challenges of Disabled Persons

The challenges of the Disability Discrimination Act require retailers to address several dynamic issues within the employment lifecycle. Practically, companies need to address fears and stereotypes that suggest people with disabilities may only be capable of undertaking a limited range of jobs, will be costly to employ, or have poor attendance records, or that they should be kept away from customers. Training can be vitally important in shaping employees’ attitudes. Where employers are concerned about the attitudes of some of their employees toward new colleagues with disabilities, arranging and promoting disability equality training needs to be a priority. In considering the working environment for people with disabilities, several issues merit attention. Before employment begins, a company member should meet with the new (or newly disabled) employee to discuss any changes that need to be made to the workplace environment and to discuss support services that may be available from the Disability Employment Advisor at the Jobcentre (Schmidt, 2004).

Disability in Ethiopia

Poor infrastructure, particularly sanitary and medical services, puts the populace in many developing nations at significant risk for disability. Political, ethnic, and domestic violence, as well as poor health and safety standards at work and at home, all increase the likelihood of developing a physical

disability. According to survey statistics from 2015–16, 9.3 percent of Ethiopia's population, or roughly 7.8 million individuals, are believed to have a disability. Up to 2.2 million of them (2.4 percent) struggle with severe issues. Around 47,000 people with severe disabilities are thought to live in Addis Ababa, and 324,000 in other major cities around the nation. The likelihood of impairment increases with age. The prevalence of severe disability ranges from 1% in children under the age of 18 to 13% in persons 60 years and older. However, because it is more challenging to quantify than impairment in adults, and because surveys in Ethiopia have not yet included modules on child functioning, it is likely that the prevalence of child disability is underreported. Children and young people under the age of 25 make up about 30 percent of all impaired individuals (Kebede, 2012).

Sewing Machine

A sewing machine is a mechanical (or electrical) device that joins fabric using thread, similar to manual sewing. Sewing machines make a stitch, called a sewing-machine stitch, usually using two threads, although machines exist that stitch using one, three, four, or more threads. Sewing machines can make a variety of plain or patterned stitches. They include means for gripping, supporting, and conveying the fabric past the sewing needle to form the stitch pattern. Most home sewing machines, as with many industrial machines, use a two-thread stitch called the lockstitch. Other common machine types are chain stitch machines and sergers (License, 2004).

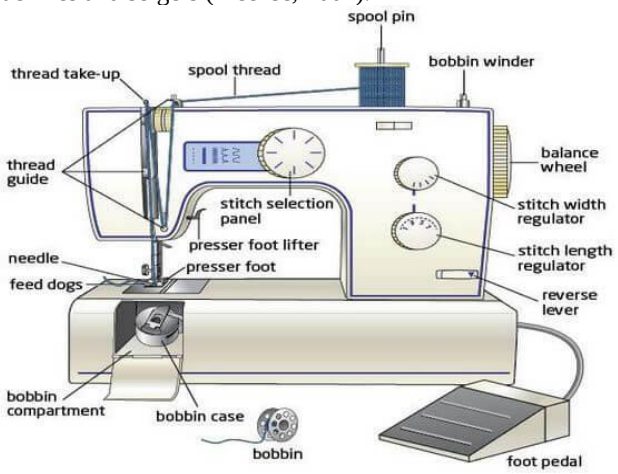

Figure 2 Sewing machine parts and functions

Different Parts and Functions of a Sewing Machine

A sewing machine plays a crucial role in the apparel manufacturing sector, with various types utilized extensively in the industry. This article presents a detailed discussion of sewing machine parts and their functions, accompanied by images, which are widely used in the ready-made garments industry.

- Bobbin Binder Spindle: This is where the bobbin is placed during winding.
- Spool Pin: The primary function of the spool pin is to hold the spool of thread.
- Handwheel: Used to raise and lower the needle, situated on the right side of the machine.
- Stitch Width Dial: Controls the width of the zigzag stitch.
- Bobbin Winder Thread Guide: Guides the thread during bobbin winding.
- Feed Dog: Moves the fabric forward during sewing.
- Thread Tension Dial: Adjusts the tension of the top thread.
- Stitch Length Dial: Controls the length of the stitch.
- Power Switch: Turns the sewing machine on and off, typically located on the right side.
- Presser Foot: Holds the fabric firmly in place.
- Needle Plate: A metal plate under the needle and presser foot that helps move the fabric during sewing (Raaz, 2017).

The foot pedal does on a sewing machine

The foot pedal on a sewing machine controls the speed at which stitches are executed on fabric. By pressing the pedal, you determine how quickly or slowly the sewing needle operates. Applying more pressure to the pedal makes the needle move faster, while less pressure slows it down. Unlike computerized sewing machines that automatically adjust speed, manual machines rely on the foot pedal for control.

Although foot pedals generally serve the same function, there are variations among different sewing machine models. For example, pressing the pedal activates a metal wedge that pushes down on the plate. This mechanism directly influences the machine's speed. Increasing pressure on the pedal reduces the resistance of the rheostat, allowing for faster operation and enhancing motor performance.

Overall, all sewing machine foot pedals operate on similar principles and mechanisms. Adjustments may be necessary to optimize their performance according to specific machine requirements (Flores, 2022).

MATERIAL AND METHODS

Materials

Table 1 Required materials for the modification of machine

Material	Purpose
Bolt, nut and wing nut	For secured material
Spring	For giving force
Flat metal	For press that by hand
Shaft	For rotate
Sponge or fabric	For covering the flat metal
Cabo	For applying force
Base metal	For connect all component

Research Method

To accommodate individuals with disabilities affecting both legs, the research focuses on adapting the sewing machine's foot pedal into a hand-operated pedal.

Product development

The design process commenced with identifying the need for a modification in the sewing machine to assist individuals with disabilities affecting both legs.

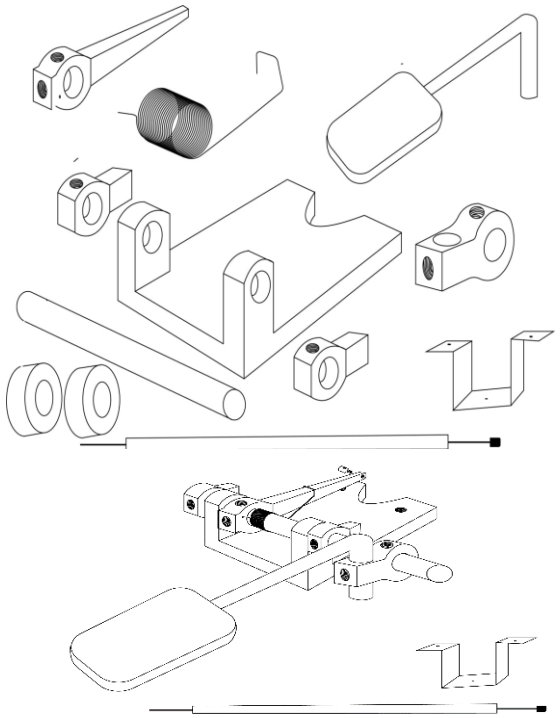

Figure 3 Component required for making hand pedal

Design of modify sewing machine

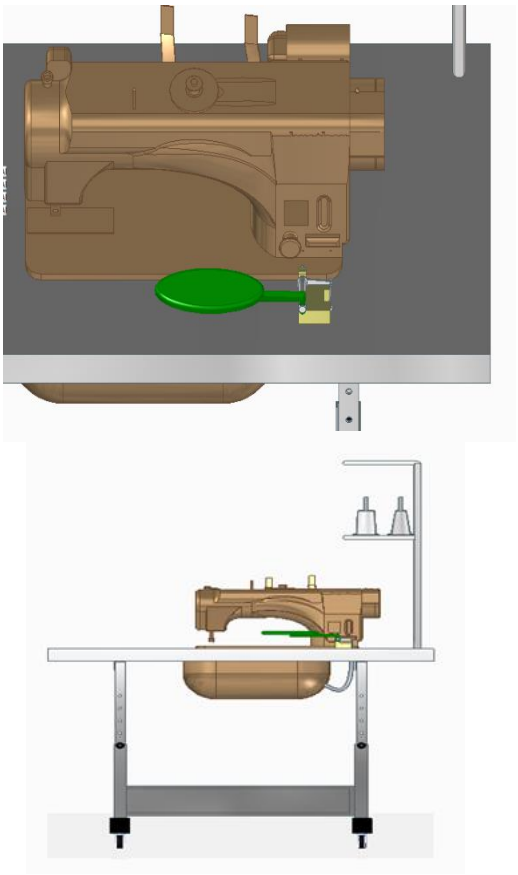

Figure 4 Modified sewing machine pedal

Table 2. Technical specification of the material

Material	Description	Function
Base metal	Hight * Length * Width 1.2cm*15cm*10cm	To hold all component of hand pedal
Main Shaft	Length 16cm, diameter 1.4cm	To rotate
Helper shaft	Length 16cm and height 1.5cm	To pull the Cabo
Spring	Length 6cm	To give force to flat metal
Bult and nut	Diameter of hole nut 1.7cm	To secured the component
Flat metal	Length 10cm and width 6.5cm	To press the spring
Wing nut	The length bolt 5.5cm diameter 0.5cm and the wing length 6.5cm	To secure the hand pedal to table
Bend metal	Total length 15 cm	To connect the base metal the wing nut
Cabo	Length 174cm	To connect the shaft and the motor

Manufacturing Procedure: The manufacturing of the hand pedal involves the following steps:

Step 1: Designing the required material.

Step 2: Cutting the material according to the required design and measurements.

Figure 6. Cutting of the required metal

Step 3: Drilling holes in the nut, base metal, and fixed metal.

Step 4: Welding the base metal, small nut, and large nut, as well as welding the auxiliary shaft and nut.

Figure 5. Welding of the metal

Step 5: Connecting the auxiliary shaft with the cable, then connecting the cable with the sewing machine motor.

Figure 7. Attaching the hand pedal to the sewing machine

Final product of the modification sewing machine

Figure 7. Final product

Working mechanism

The machine operates with a hand pedal system. When the flat metal is pressed by hand, the spring compresses and the main shaft moves anticlockwise. Subsequently, the auxiliary shaft moves upward, after which the cable pulls the motor. Finally, the needle moves up and down, enabling the sewing or stitching process.

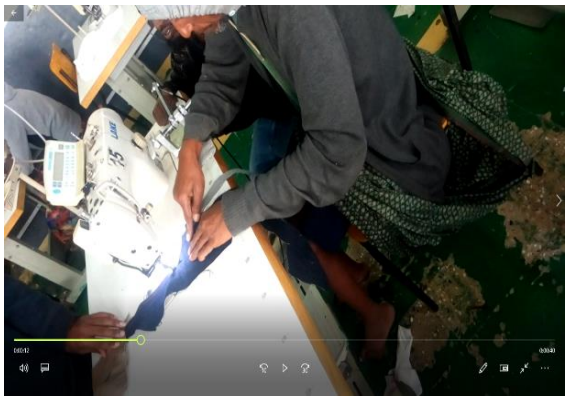

Figure 8. sewing of garment by two legs disabled person

Features of the Modified Sewing Machine

Good Ergonomics and Controls for Individuals with Disabilities: The machine is designed to be responsive to pressure on the hand pedal, making it accessible for people with both legs impaired.

Hand Pedal Usage: The machine is operated using a hand pedal instead of a foot pedal, allowing users to control the speed by hand.

The newly improved hand pedal sewing machine is essential, especially for individuals with both legs impaired. Users were thrilled when the machine started working, as they had previously believed they couldn't sew. Initially, they found using the machine challenging, but once they were taught how to sew, they were delighted to learn they could stitch by hand.

After sewing garments with the modified machine, individuals with both legs impaired shared their reflections. A video was taken and shown to residents of the Bahir Dar Physical Rehabilitation Center. They were very happy to see how they could sew garments using their hands.

Table 3. After modification of sewing machine

Parameter	Existing machine	Modification machine
Working mechanism	By foot pedal	By hand pedal
Working for both legs disabled	Not suitable	Suitable

Figure 9. Before modification of sewing machine and after modification of the sewing machine

CONCLUSION

In Bahir Dar, Ethiopia, especially at the physical rehabilitation center, many people with disabilities affecting both legs live in poverty. They often rely on family, neighbors, and friends for their livelihood. Society tends to view individuals with disabilities as useless, dependent, and incapable of performing jobs like able-bodied individuals. One of the main challenges for those with leg disabilities is moving from one place to another. Therefore, the sewing sector presents a viable solution for them.

Our project aims to change societal perceptions by demonstrating that people with disabilities can perform various jobs. Disabled individuals do not need to be poor, excluded, or segregated. By working with sewing machines in their own shops, they can achieve independence and improve their economic status. This shift not only enhances their working culture and habits but also contributes to the country's economy. People with disabilities can transform their lifestyle from dependent to independent and challenge societal expectations by demonstrating their competitiveness in applicable work conditions.

RECOMMENDATION

This project addresses the challenges faced by many individuals with leg disabilities by creating job opportunities through our hand pedal sewing machine initiative. By enabling these individuals to run their own sewing shops, we not only create job opportunities but also generate income for them. This brings satisfaction to our minds and provides economic benefits for the country, particularly in the garment and apparel sector.

For garment companies, it is important to hire operators with leg disabilities because the job requires sitting for long periods, which these individuals can do effectively. Employing disabled persons not only enhances productivity by tapping into a dedicated workforce but also ensures a steady supply of operators, leading to improved overall output.

For the government, when disabled persons start working in companies, they earn salaries that allow them to meet their essential needs. Additionally, the Ethiopian government benefits by receiving 15% of their salaries as tax, showcasing an economic advantage stemming from the newly modified sewing machine.

For future researchers interested in modifying and developing machines or creating software applications, this project offers valuable insights. Focusing on aspects such as ergonomic design for sewing tables and adjustable thread guides for disabled operators could address the needs of a significant population in Ethiopia. Our documentation can serve as a useful reference for their studies and innovations.

DATA AVAILABILITY

The data used to support the findings of this study are included within the article.

CONFLICTS OF INTEREST

The author declares there are no conflicts of interest regarding the publication of this paper.

DECLARATION ON INTELLECTUAL PROPERTY INFRINGEMENT

The author declared that the: 1. Necessary permissions have been obtained for any third-party materials used (e.g., figures). 2 I am responsible for any claims arising from the breach of intellectual property rights related to the submitted manuscript. 3. The manuscript does not contain any material that violates any existing copyright or other intellectual property rights

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