

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

**Need Assessment, Designing, and Effectiveness of
Adaptive Clothing for Adult Female Patients
of Hemiplegia of Grade 0-3 in Pakistan**

A Thesis Submitted to University of the Punjab, Lahore

in Fulfillment of the Requirements for the

Degree of Master of Philosophy

In Home Economics



Asna Mubashra

College Of Home Economics, Lahore

2011

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Dedicated To

The Lone

Who Blessed Me with Power of Expression

“Allah”

“One who goes out in search of knowledge is in Allah’s path till returns.” (Al-Hadith)

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Abstract

The improvements required in the normal clothing designs for a special group of people and ways these can be taken care of by clothing principles were explored. The special group for this research was Pakistani adult female patients of hemiplegia of grade 0 to 3. Research process comprised of assessing clothing needs, co-designing, and evaluating effectiveness of one adaptive garment after wear trial of three weeks. The dissertation topic originated from the researcher's questioning the lack of adaptive clothing for this specific group and was based on preliminary conversations with a few women who encountered failure to get hold of solutions which were both functional and visually appealing with reference to the local context of dress style and standards of modesty. A combination research process was used, employing data collection by in depth, semi structured, interviews and thematic analysis strategy to assess needs from a group of three participants. The assessment of the specific needs generated ideas for adaptation in normal clothing designs. Need assessment indicated that only clinical definition could not serve as basis for design construction, it provided categorization of physical effect of disease on body. Participants with different span of infirmity had similar clothing needs and preferences and they required design options to be visually near to the normal style of dress. This study suggested three most practical and functional adaptive design options as a result of co designing efforts. One trial adaptive garment was constructed for wear trial with same group of participants. Researcher concluded that although the trial adaptive garment was successful, more efforts should be made to encourage designers to work for such target groups. Such patients will be able to obtain the quality of life, maintain the dignity, and make the tasks of dressing and undressing easier by the recommended convenient and comfortable adaptive clothing design solutions Questions for future research were proposed.

Chapter 1

Introduction

Clothing is one of the essential needs of all people and is a subject of universal interest. This subject has a multidimensional approach. Ever increasing dimensions have brought into limelight the strong contributions of this subject in exploring probabilities of designing to serve a specific purpose, the functional aspect of clothing. Normal people have very little difficulty in purchasing attractive and fashionable clothing in standard sizes that satisfy their personal and social needs but for those who are surviving from hemiplegia or any other medical disorder, causing restricted or no movement of joints, the problem of satisfying their clothing needs is very difficult or impossible to meet.

Expressing with clothing is the right that everybody has. This study proposed to examine how the needs and preferences of a specific type of clothing users could be translated into a satisfactory clothing design option. This introductory chapter provides a general background for the concepts, together with an outline of purpose and objectives of this research project. Also included are the operational definitions that provide clarity to the text.

1.01 Theoretical Background of Adaptive Clothing

Adaptive clothing is a clothing design concept that helps to minimize joint movements performed by patients and decreases the amount of patient handling performed by attendants (Yassi & Hancock, 2005). The outcome is reduction in pain and discomfort for both attendant and patient (Garg & Owen, 1992). Clothing problems arising from a medical situation and knowledge of this medical situation along with physical limitations and problems faced in daily life by such patients helps to develop

approach of adaptive design ideas for the garments which meet all the needs of such individuals (Moses, 2008).

Whatever the type of disability with which a person is affected, the surrounding environment can either positively or adversely affect quality of life. Clothing is an important facet of the human constructed environment surrounding an individual and, therefore, has bearing on quality of life (Bubolz, Eicher and Sontag, 1979).

Clothing is required for three reasons: protection, comfort, and dignity. People who are affected with a physical disability might be ‘differently able’ (E. Braaten, 2000), but they need clothing for the same reasons. The need for recognition and accomplishment is very important. Independence in performance of daily functions like dressing is necessary for physical, mental, and emotional growth. Making the most for a patient's convenience is a step toward self-reliance, and a feeling of acceptance and belonging. Clothing can be an important factor in developing self-reliance in the hemiplegia patients.

The problem of finding suitable clothing for individuals with physical disabilities has been a topic of concern for clothing, medical, and rehabilitation researchers for over half a century. Beginning in the 1940s, clothing and medical professionals started to examine the relationship between clothing and physical disability (Cardwell, 1947; Dillingham, 1948).

The bulk of this research resulted in publication of various self-help guides for the ‘handicapped’ and their caregivers, designed primarily to ease daily processes such as dressing and undressing. These guides also provided practical clothing solutions for other situations (e.g., wheelchair confinement, mobility using assistive devices). Subsequent research in the latter part of the 20th Century explored the psychological issues of ‘functional’ clothing, as clothing for people with disabilities came to be known,

primarily by assessing the importance of clothing as an “appearance management tool” (Caldwell, 1999; Freeman, Kaiser & Wingate, 1986; Kaiser, Freeman & Wingate, 1985; Liskey-Fitzwater, Moore & Gurel, 1993). In the late nineteenth century psychologists, sociologists and anthropologists engaged in study of the social significance of clothing (Kidd, 2006).

In spite of the usefulness of such research, the formulation of a comprehensive and complete theory base for researchers in this area has not materialized and the body of work is fragmented. No consistent framework exists within which to organize and disseminate research findings and, in some cases, deficiencies exist in some areas and overlap occurs in others (Newton, 1984-1985). Since the 1960s, researchers have investigated clothing solutions that address multiple problems (Hallenbeck, 1966; Phipps, 1977; Schwab & Sindelar, 1973), but they concluded that the nature of individually distinct disabilities appeared to defy general solutions.

Evidence exists that people, with all physical disabilities, place value on the social acceptance of their clothing (Caldwell, 1999; Thoren, 1997). Lack of visual attraction causes adaptive clothing symbolically to represent people with disabilities as somehow deviant from the norm, before the visual impact of disability is even considered (Lamb, 1993). Additional research has demonstrated that many functionally designed garments are attractive but lack aesthetic appeal, and situational appropriateness (Freeman, Kaiser & Wingate, 1985-1986).

Adaptive clothing allows patients to maintain dignity and wear such clothing styles with which they are familiar and comfortable (Wojciechowski, 2003). Different styles of adaptive clothing are best suited to specific nature of the wearer's disabilities (Kidd, 2006). These allow the patient to be dressed easily while sitting or lying down,

eases the buttoning task for care workers, and minimizes awkward shoulder postures normally experienced by patients (Ali, 2004).

Adapted garments are usually roomier, have elasticized waistbands, and use oversized buttons or snaps. Other modifications take into account specific constraints or problems experienced by individual patients (Meinander & Varheenmaa, 2002). For example, shirt and tops are split down the back and additional fasteners are added to close the garment (instead of ties or traditional shirt buttons). Adapted pants can be split along the sides to assist dressing or in the rear to aid in dressing and toileting (Na, 2007).

1.02 Factors Affecting Adaptive Clothing Design

There are several essentials that adaptive clothing designs must have. Schematic representation of the factors affecting adaptive clothing is shown in Fig 1. Unless all these factors are kept in mind while creating adaptive designs the desired outcomes are not possible. Successful adaptive designs consolidate all these factors.

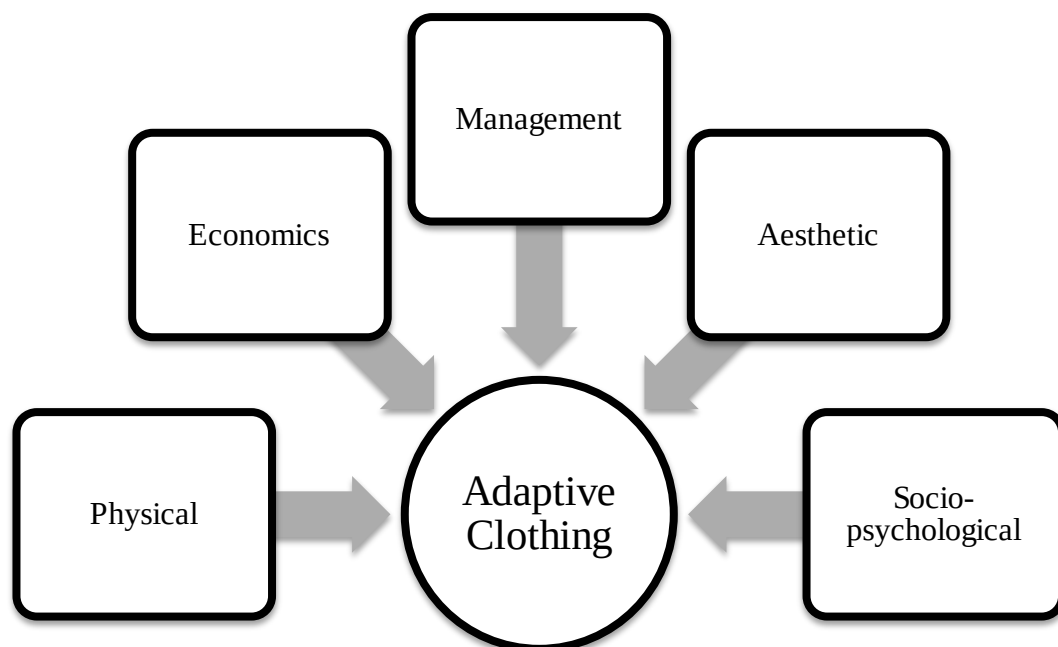


Figure 1 : Factors affecting adaptive clothing. Adapted From “Fashions For The Women Who Need Specially Designed Cloths” by Behrens, 1963.

1.02.01 Socio-Psychological Aspect.

In socio-psychological aspect, looking good, feeling good, and having the right clothes that promote the independence in dressing can increase self confidence and self-esteem in look. In other words, adaptive clothing can provide an immense socio-psychological boost among the individuals with special needs.

1.02.02 Aesthetic Aspect.

People with special needs face the inconvenience of shopping for clothes. The majority of those consumers experienced major problems in finding fashionable clothes that fit their disabilities. In aesthetic aspect, all clothes should be attractive and fashionable showing off the wearer's good points and conceal the disablement. For a fashionable look, changes in the adaptive clothing should be invisible when the garment is worn (Kennedy, 1981).

1.02.03 Management Aspect.

Disabled people need to consider the extra wear and tear on clothing because they get far more wear and tear and washing than do garments made for the able-bodied. Wheelchair arms, or the joints of appliances can cause heavy wear at particular points. It is wise to make sure that garments are made of strong enough material at particular points. A major difficulty can be that tough fabrics produce bulky seams which may damage sensitive skins or cause pressure sores. In this case, clever design of the garment with careful positioning of the seams is needed to reduce the problem (Thorton, 1990).

1.02.04 Economic Aspect.

In economical aspect, products at affordable prices are in great concern of adaptive clothing since most of people with special needs have lower incomes and higher cost. Give consideration to the purchase price of a garment and the cost per wearing. And

it is wise to select items which can be matched to several units to extend the wear life of a garment and reduce the cost of each wearing (Kennedy, 1981).

1.02.05 Physical Aspect.

For the individuals with special needs comfort and easy access must be considered. Clothing must be convenient to put on and take off, with good long openings and the minimum of fastenings. It makes the task of getting dressed easier and less painful and frustrating by utilizing unique features, such as Velcro closures or snaps.

Protection is needed for those who have little or no control of mouth muscles and tend to dribble, otherwise their upper clothing will be constantly wet, which often leads to chest infections. Delicate skin needs protection from rubbing or pressure caused by rough seams or bulky fastenings. By considering physical aspects, adaptive clothing can promote independence of the people with special needs in dressing and also provide ease in the dressing process for the caregiver.

Present research is strongly focusing on all of these aspects while designing adaptive clothing. Socio-psychological, aesthetic, management, economics, and physical aspects are considered as baseline in creating adaptive clothing designs. In socio-psychological aspect, adaptive clothing can provide immense boost among the individuals with special needs. In aesthetic aspect, it should be attractive and fashionable. In management aspect, wear and tear problem should be solved with careful positioning of the seams reducing pressure sores out of tough fabric. In economical aspect, it should be within the reasonable price range so that individuals with special needs can afford. In physical aspect, comfort and ease must be considered to make dressing easier and less painful and frustrating (Wojciechowski, 2003). Adaptive clothing design options in the local context are almost completely lacking.

1.03 Adaptive Design Considerations

The two most important considerations when adapting the clothing are to reduce patient pain by minimizing joint movements and to decrease the amount of manual repositioning of the patient by the attendant. Clothing must not cause any kind of discomfort while its use. Clothing is an essential part of every ones appearance, and it also shows a part of personality of wearer. The dignity of the patient is also a consideration, as it is essential that the adapted clothing should not make the patients feel institutionalized or embarrassed in any way (Kidd, 2006). These specific considerations are same for women surviving from attack of hemiplegia and suffering from restricted movements. The individual requirements of these women regarding clothing are much more diverse than for people with normal condition. These specific needs and preferences of clothing which dictated the performance requirements for adapted garments are compiled in this study as a feedback from patients themselves.

“Clothing provides a means for self-expression and aesthetic enjoyment, a way to conform or not conform, a way to suggest wealth and prestige, an outlet for creative energies and much else” (Newton, 1999).

1.04 Hemiplegia: Living With Half Body

Hemiplegia is paralysis of one side of the body or severe or complete loss of motor function on one side of the body. This condition is usually caused by brain diseases that are localized to the cerebral hemisphere opposite to the side of weakness. Less frequently, brain stem lesions; cervical spinal cord diseases; peripheral nervous system diseases; and other conditions may manifest as hemiplegia (Moses, 2008). Our brain is divided into two hemispheres and when one side is damaged, paralysis of the other side of the body results. Hemiplegia is not an uncommon disorder in adults.

Hemiplegia definition may imply paralysis but the appearance can vary enormously. Moreover, other features of hemiplegia definition may be loss of speech, inability to swallow, urinary incontinence, memory loss, depression, or visual impairment. Unfortunately the majority of cases of hemiplegia have no cure. Most people who have hemiplegia after a stroke may recover to some degree but full recovery is rare. The exact cause of hemiplegia is not known in all cases, but it appears that the brain is deprived of oxygen and this results in the death of neurons. When the cortical spinal tract is damaged, the injury is usually manifested on the opposite side of the body. For example if one has an injury to the right side of the brain, the hemiplegia will be on the left side of the body (Webster's dictionary of the English language, 1987).

1.04.01 Signs and Symptoms.

Hemiplegia is a condition in which half of a body has compromised motorist functions. Hemiplegia is more severe than hemi paresis, wherein one half of the body is weakened but not paralyzed. Hemiplegia means severe weakness of the limbs on one side of the body but the specific features can vary tremendously from person to person. Problems may include difficulty with gait, difficulty with balance while standing or walking, having difficulty with motor activities like holding, grasping, or pinching, increasing stiffness of muscles, muscle spasms, difficulty with speech, difficulty swallowing food, significant delay in achieving developmental milestones like standing, smiling, crawling, or speaking the majority of children who develop hemiplegia also have abnormal mental development, behavior problems like anxiety, anger, irritability, lack of concentration or comprehension, emotions- depression. Recovery of disturbed motor function following from a cerebral lesion causing hemiplegia ceases in less than a year. Some functions recover rapidly but others remain as permanent motor deficits. Muscle weakness can also be analyzed by measuring grasping force (Moses, 2008).

1.04.02 Treatment.

Hemiplegia is not a progressive disorder; however, because of lack of mobility, other complications can occur. Complications may include muscle and joint stiffness, loss of aerobic fitness, muscle spasms, bed sores, pressure ulcers and blood clots. Sudden recovery from hemiplegia is very rare. Many of the individuals will have limited recovery, but the majority will improve from intensive, specialized rehabilitation. It is vital to integrate the hemiplegic persons into society and encourage them in their daily living activities. Rehabilitation is the main treatment of individuals with hemiplegia. In all cases, the major aim of rehabilitation is to regain maximum function and quality of life. Both physical and occupational therapy can significantly improve the quality of life.

1.04.03 Muscle Strength Grading.

Hemiplegia is not an uncommon medical disorder. In elderly individuals, strokes are the most common cause of hemiplegia. In assessing muscle strength parameters it is important to have an idea of the normal bulk and strength of the different muscles in relation to the general build and age of the individual.

Muscle strength has been graded as Grade 0: total paralysis, Grade 1: palpable or visible contraction only a flicker of contraction is present, Grade 2: full range of motion with gravity eliminated patient can manipulate the limb when gravity is eliminated by suitable positioning, Grade 3: full range of motion against gravity: limb can be moved against gravity, but not against further resistance, Grade 4: full range of motion with decreased strength there is some degree of weakness ranging from poor, fair or moderate strength, Grade 5: normal strength, not testable (Moses, 2008).

The degree of motor disturbance in hemiplegic patients can be assessed with respect to hemiplegic postures, paretic limb or body movements, grip strength, and precision grip with the fingers.

1.04.04 Role of Adaptive Clothing.

Hemiplegia affects people in many ways and in different degrees. When someone experiences a stroke and is paralyzed the act of getting dressed is a painful ordeal both physically and emotionally. Changes and limitations that occur in physical body are more pronounced for the people with this special need and they have great difficulty finding garments that fit correctly, hang properly and being dressed easily (Meinander & Varheenmaa, 2002). Progress in learning to dress independently is hard to achieve when the clothing one wears is difficult to manipulate and does not fit well. Adaptive Clothing provides solutions that both the patient and the care giver have an easier time with dressing. If a person has a specific need, designing clothing to accommodate that need is required (Ali, 2004). Different types of adaptations allow the patient to be dressed with minimal rolling, lifting, or repositioning.

1.05 Statement of the Problem

The current study was a case study about the need assessment, designing and determination of effectiveness of adaptive clothing for adult female patients of hemiplegia of grade 0 to 3 in Pakistan. The researcher's focus was on understanding deeply the requirements of adaptations in clothing for this special group of population then efforts were made to co design some solutions to address assessed needs and finally trial wear of one of the solutions by same group to determine the effectiveness of the implemented clothing adaptations.

1.06 Objectives of the Study

The purpose of this study was to offer ideas and solutions for the special need's clothing designs by combining fashion and function. To provide the right clothing for the people with special needs recommended designs were ideal for any one with limited

mobility and one who prefers the ease of being dressed from seated or lying position. To make the act of dressing and undressing free of pain and struggling and to simplify the dressing activity.

The broad objectives of the research were to identify the problems that can occur concerning clothing of hemiplegia patients and to suggest solutions for these to substantially improve their quality of life by giving a better choice of good looking functional clothing option. The study brought into limelight the special structural requirements of clothing in living environment.

The specific objectives proposed for this research were:

- To identify areas of dress which require adaptations for adult female patients of hemiplegia of grade 0 to 3 in Pakistan.
- To co-design adaptive clothing solutions for adult female patients of hemiplegia of grade 0 to 3 in Pakistan.
- To find the effectiveness of a proposed adaptive clothing design for adult female patients of hemiplegia of grade 0 to 3 in Pakistan.

1.07 Rationale of the Study

The purpose of this study was to explore the possibilities of making suitable clothing for adult female patients of hemiplegia of grade 0 to 3 in Pakistan. The objectives were to obtain information about clothing needs and preferences from a group of women, use this information to co-design and create structural modifications in clothing that suit the unique needs in local context of modesty and style, evaluate the women's satisfaction with a wear test of trial garment, and suggest further research strategies.

There are a number of hemiplegia adult female patients suffering from severe physical limitations in Pakistan having specific clothing needs; hence the development of adaptive clothing for this population is strongly felt. Pakistan has its own unique dress styles and standards of modesty for women. No study has been done to provide solutions for such special needs in local context. Such women will be able to obtain the quality of life, maintain the dignity, and make the tasks of dressing and undressing easier by the recommended convenient and comfortable solutions of adaptive clothing designs.

The ethics dictate that the needs of such people should also be realized in order to provide opportunities of a better life for them and efforts are required to make their daily life as comfortable as possible. This study is a contribution of the expertise of researcher to present ideas and solutions to address these special needs of clothing. Better appearance through improvement of clothing will help these people to believe that they have worth in the sight of others and in their own view. Such patients can make the access to the world a little easier by provision of adaptive clothing designs.

The feeling of self-confidence, the sense of well-being and of social acceptance that comes from the wearing of clothing which is functional, appropriate and attractive is important to all people but to those with special needs it is much more important. Adaptive clothing can provide an immense socio-psychological boost among such women. Until recent years little research has been shown in developing adaptive clothing for various types of physical limitations. Earliest efforts to develop more practical clothing for individuals with special needs were pioneered by occupational therapists that had daily contact with such people and their dressing problems.

The pressing need for clothing that such people can manage is further emphasized by Boettke (1997) in a study conducted to determine how much help is considered necessary by the patients in activities of daily living. Dressing is the activity

needing help ranging from complete help to occasional help. Dressing poses a problem for hemiplegia patients because of poor muscular coordination or extraneous movement and conditions worsen when the selection of appropriate clothing is none or very limited by what is available.

Until recently little interest has been shown by manufacturers in the design and construction of clothing for the person for whom dressing may be a problem. Till today Most of the clothing for the people with physical limitations has to be specially designed and ordered.

Women surviving from hemiplegia, no less than the rest of us, desire good design in the clothes they wear. The selection of clothing is largely an individual problem, based on particular needs and preferences. As a group of people having the same general physical limitation, their needs and preferences can be same thus same design can be a solution for all. These needs are not met by traditional clothing. The outcome of the study would be equally useful for anyone with limited mobility, ones who need care due to problems of weight bearing or limitation of dexterity and to accommodate challenges of severe arthritis, frozen shoulder, Alzheimer's disease or extreme weakness due to any other reason.

1.08 Definition of Key Terms

The following terms were defined for use in the study as appropriate to the time period in which it was conducted:

Adaptive Clothing: Adaptive clothing is clothing designed for people with physical disabilities, all who may experience difficulty dressing themselves due to an inability to manipulate closures, or due to a lack of a full range of motion required for

self-dressing. (Valley & Court, 2003) Adaptive clothing typically offers such designs so that an individual can be dressed more easily. (Newman, Springer, & Dee, 2004)

Hemiplegia: Paralysis of one side of the body or severe or complete loss of motor function on one side of the body. This condition is usually caused by brain diseases that are localized to the cerebral hemisphere opposite to the side of weakness. less frequently, brain stem lesions; cervical spinal cord diseases; peripheral nervous system diseases; and other conditions may manifest as hemiplegia (Moses, 2008).

Activities of Daily Living: These include: Bathing, Dressing, Feeding, Toileting, Transferring from bed or chair, Walking (Beamish, 1999).

Don: To put on; dress in (Morris, 1975).

Doff: To remove or take off (Morris, 1975).

Ease: Ease is a way of facilitating clothing fit by allowing extra room at a certain point. “Ease refers to the amount of roominess in a garment...Ease is the difference between the measurements of the garment and the measurements of the body of the intended wearer” (Brown & Rice, 1998, p.144).

Functional Clothing: Clothing that has as a special feature specific utility for a particular population, (for example protection, thermal comfort, fit, ease of movement) (Lamb & Kallal, 1992).

Physical Disability: “A condition that impairs or imposes restrictions on a person’s ability to function at normal or expected levels of physical activity” (Dell Orto & Marinelli, 1995)

Quality Of Life: A concept that has been viewed in several ways, including: (a) self actualization, (b) personal utility (pleasure, happiness or desire fulfillment), (c) opulence (wealth, real income), (d) standard of living, and (e) meeting of basic needs (having, loving, being) (Sirgy & Samli, 1995).

Mobility: The state or quality of being capable of moving or being moved (Webster's, 1987)

Health: The state of fitness of the body or of the mind (Webster's, 1987)

Summary: This chapter has discussed the basic theoretical concepts about the relatively new term of adaptive clothing. The evolution of the concept has been explored. The importance of functional aspect of clothing is discussed. Different factors that affect the creation of adaptive designs are brought into limelight. The existing rising need of the adaptive clothing for different type of special populations is discussed. It is highlighted that the requirements of adaptive clothing differ according to the underlying cause of physical disability of specific groups. Keeping this differentiated nature of adaptive clothing needs in mind the focus of present study was set to the specific requirements of adaptive clothing for one special group of people that is, hemiplegia adult female patients. For this a brief understanding of the disease and its related clinical symptoms are discussed to create a basic awareness of this segment of people. After focusing the topic in the problem statement, the objectives were formulated with the help of initial review of existing concepts and finally the rationale of this study has been discussed in detail. Operational definitions were given at the end of chapter for the ease of understanding of the reader.

Chapter 2

Review of Related Literature

2.01 Literature Review

A literature review is an appraisal of literature related to a particular subject or theme. The aim is to choose, examine, describe, and critique the opinions, facts, research and overall output of author. The reader of literature review should be able to understand directions of thought, topics of concern, unanswered questions, quality of research, background of authors and publications, points of conflict and the importance given to ideas presented” (Khan, 2010).

This chapter outlines previous research in areas pertinent to specialized clothing. The chapter begins with a brief overview of type of physical disability caused by onset of some disease. Specific classification schemes that have been used to describe disability are explained. A review of clothing literature on people with some kind of physical disabilities is included. A brief historical perspective of research focusing on clothing as a rehabilitation and self-help tool is followed by a social/psychological perspective. This perspective is important, giving the symbolic as well as functional aspects of clothing. Finally, fusion to the present research is discussed incorporating potential gaps found in the efforts made in this direction till today as a result of the literature search.

2.02. Physical Disability

Disability as a concept is very difficult to define or measure specifically, due to the diverse nature of its various manifestations in the human body; therefore, conceptual clarity is fundamental to the development of a working theoretical base for clothing research.

2.03.01 Definition Of Physical Disability.

In general, medical and rehabilitation literature refers to disability as “the various impacts of chronic and acute conditions on the functioning of specific physiologic systems, on basic human performance, and on people’s functioning in necessary, usual, expected, and personally desired roles in society” (Jette, 1994). This definition appears to imply that disability begins with an effect at the organ level, then at the body level, expands to affect broad aspects of human performance, and finally, impacts an individual’s interaction with society.

2.03.02 Types of Physical Disability.

Physical disability can manifest itself in many forms at many body levels, and can be very visible or not at all visible to outsiders. Three major origins of disability exist including congenital, developmental, and acquired, but noticeable overlaps and ambiguities exist. For example, an amputation can be caused by a developmental disease like hemiplegia or by some type of accident (acquired disability). Table 1 demonstrates each of the three classifications and gives some common examples in each group with main characteristics and physical impacts upon the body (Dell Orto & Marinelli, 1995). Within each of the three classifications a variety of disabilities exist.

Table 1 :

Classification 1: Congenital Origin of Disability

(stemming from hereditary genetic factors)

Condition	Definition	Physical Limitation
Spina bifida	Abnormal development of the lower portion of the spinal cord.	Partial or complete lower extremity paralysis and an inability to develop bladder and bowel control.
Scoliosis	Lateral deviation in normal straight vertical line of spine.	Deviation in appearance, noticeable asymmetry to upper part of the body.

Table 2 :

Classification 2: Developmental Origin of Disability
(diagnosed from symptoms that increase in severity)

Condition	Definition	Physical Limitation
Cerebral palsy	Non progressive malfunction of the central nervous system due to brain damage.	Abnormal motor control affecting the musculoskeletal system, limited mobility and self care skills.
Rheumatoid & osteoarthritis	Inflammation of joints.	Chronic pain, stiffness, fatigue, changes in appearance, limitations in joints of fingers, neck, lower back, hips,& knees.
Multiple sclerosis	Disease of the central nervous system.	Motor impairment including difficulty walking and increased fatigue.
Muscular dystrophy	A chromosome based disease with many different forms.	Progressive muscular weakness and atrophy..
Polio	Disease of the central nervous system.	Involves stiffness and possible paralysis, atrophy in group of muscle contractions and possible deformity
Hemiplegia	Stroke.	Usually results in paralysis of one side of the body.
Fibro-myalgia	Musculoskeletal aches in the soft tissues.	Decrease in muscle strength, occasional muscle spasm, chronic pain, fatigue.

Table 3 :

Classification 3: Acquired Disability (Occurring Through Accident, Disease, And Injury)

Condition	Definition	Physical Limitation
Partial or complete paralysis	Paraplegia: paralysis of lower limb, part or whole Quadriplegia: paralysis of all four limbs due to injury to neck	Partial or complete lower extremity paralysis and an inability to develop bladder and bowel control.
Amputation	Lateral deviation in normal straight vertical line of spine.	Deviation in appearance, noticeable asymmetry to upper part of body.

Source Table 1, 2, and 3: Definitions obtained from Encyclopedia of Disability and Rehabilitation by Dell Orto, and Marinelli, (1995)

2.03.03 Schemes Used To Explain Disability.

Before exploring the interaction of clothing with disability, clarification is necessary to determine the specific type of limitations that are main feature in disability research. In order to understand the problems of the user of the clothing product, one must understand the way in which the particular physical disability is viewed as a departure from the normal realm of functionality or as a limitation to the normal course of life events. By understanding the differences in daily living caused by disability, a clearer picture of clothing problems and preferred needs can be obtained. According to Jette (1994), four schemes exist to guide research and address the whole spectrum of disability from the individual body system to social roles.

“These schemes seek to delineate the major pathways from disease or active pathology to various types of functional consequences” (Jette, 1994).

The four schemes were developed by Nagi (1965), the World Health Organization (WHO) (1980), the National Center for Medical Rehabilitation Research(NCMRR) (1992), and Pope and Tarlov (1991), whose scheme was developed as a modifier to the Nagi scheme. The first scheme, formulated by Saad Nagi (1965), begins at the level of active pathology, moves through impairment and functional limitation and ends with disability (see Table 2). In the Nagi scheme, the active pathology/disease occurs at the cellular level leading to an interruption in the body’s normal physiologic function. Impairment refers to loss or abnormality at the tissue, organ or body system level. Functional limitation focuses on restrictions in performance at the whole person level, while disability usually implies restrictions on a social/cultural level. These restrictions include basic activities of daily living, (e.g., dressing and undressing), instrumental activities of daily living (e.g., shopping, light housework, managing money, using the telephone, transportation, preparing meals), social roles, social activities, and leisure

activities (Jette, 1994). As dressing is considered a basic activity of daily life, clothing factors become important to the individual at this final, social/cultural level, termed disability by Nagi (Stage Four, Table 2). Using the Nagi scheme, limitations in functioning on a social/cultural level, not the origin of the disability itself, are therefore the cause of dissatisfaction with clothing products among Users (MacDonald, Majumder & Baima, 1994).

Table 4 :

Classification Schemes Showing Differences In Terminology Of Stages

Scheme	Stage one	Stage two	Stage three	Stage four	Stage five
Nagi (1965)	Active pathology	Impairment	Functional limitation	Disability	
ICIDH (1980)	Disease	Impairment	Disability	Handicap	
NCMRR (1992)	Pathophysiology	Impairment	Functional limitation	Disability	Societal limitation
Pope & Tarloy(1991)	Active pathology	Impairment	Functional limitation	Disability	Quality of life

The second scheme used to guide and organize research is known as the International Classification of Impairments, Disabilities and Handicaps (ICIDH), and was developed in 1980 by Philip Wood for the World Health Organization (WHO). The stages in the ICIDH scheme conclude with handicap as the final stage (see Table 2). Handicap is a state which is generally seen as a disadvantage for a given individual and which results from an impairment or disability. The handicap limits or prevents

fulfillment of a role that is normal for that individual (relative to other people). The dimensions of the handicap stage in the ICIDH include orientation, physical independence, mobility, occupation, social integration, and economic self-sufficiency (Jette, 1994). Using the ICIDH scheme, clothing could be seen as playing a part in at least three of these dimensions: physical independence, mobility, and social integration. One problem with the ICIDH scheme is that handicap is a term currently in disfavor because of its negative connotations. However, handicap as defined in the ICIDH scheme could be alternatively defined and characterized as a quality of life limitation (Pope & Tarlov, 1991). If this revised conceptualization is an acceptable alternative, then every day clothing could be considered a dimension of quality of life for an individual with a physical disability.

The third scheme was developed by the National Center for Medical Rehabilitation Research (NCMRR) in 1992. It extends beyond disability to include a final stage of societal limitation, which describes the impact of disability upon an individual's functioning in society (see Table 2). This societal limitation stage incorporates restrictions caused by society, or by barriers restricting achievement of a role (inadequate clothing could be seen as one such barrier). Once an individual interacts with, and becomes limited by, his or her functioning in society, the disability moves from the personal to the environment. In this case, any feelings of limitation would, therefore, emanate from the environment rather than the disability. In the NCMRR scheme, power or control over the environment (with clothing being a dimension of the near environment) should result in a diminished feeling of disability in relation to that particular role in society. If appropriate clothing can empower individuals, this should result in reduced feelings of limitation.

In each of these three schemes, major pathways lead from the disease or active pathology to the various types of functional consequences (see Table 2). In a fourth scheme, Pope and Tarlov (1991) modified the Nagi scheme (1965) by adding quality of life as an outcome, encompassing functional limitation and disability at the personal/social level. According to Pop and Tarlov, quality of life corresponds to total well-being both in a physical and psychological sense. Their dimension of quality of life includes the following: performance of social roles, physical status, emotional status, social interactions, intellectual functions, economic status, and self-perceived or subjective health status. Used in this sense, quality of life seems to overlap the last two dimensions of Nagi's scheme, functional limitation and disability, as these tend to be measured in terms of social integration. In this case, clothing certainly has a place in a quality of life framework for individuals with physical disabilities. Clothing can be seen as a part of the quality of life component, as it operates as a facilitator of social functioning. Using Nagi's scheme (1965) with Pope and Tarlov's quality of life adaptation (1991) or the NCMRR scheme (1992) in its original form, the disability can be traced from its pathological origin to the point where inadequate clothing impacts an individual's role. Thus, one outcome of disability is the perceived restrictions of society on the individual, or the individual's role in society described by quality of life

2.03.04 The Impact Of Physical Disability On Clothing.

Physical disability affects the type of clothing that can be worn. The extent of the effect depends on the type of disability, the degree of physical limitation, and the body part(s) affected by the disability. Due to the numerous variations of physical disability that exist, identifying a framework within which unique clothing issues might be clearly defined and organized is a complex but necessary process. In fact, Newton(1984-85) placed the fewest existing studies into this category, perhaps showing unwillingness on

had reservations about the clarity of research on clothing solutions, and highlighted repetitive and overlapping research as drawbacks to a consistent system of research and application. A significant outline of diseases or injuries related to disabling conditions was prepared by Yep (1976). Yep specified the disabling conditions related to clothing for several types of situations. For example, the disabling conditions for multiple sclerosis were listed as: limited sense of balance, large muscle in coordination, excess movement (tremor), limited strength and endurance, incontinence, sensory loss and visual impairment.

One significant effect of disability is to restrict or impede mobility. Mobility is also a significant issue for clothing. A certain amount of ease in clothing is necessary for donning and doffing, manipulating fasteners, adjusting clothing once it is on the body, and comfortable movement, so that the individual does not have to work against their clothing (Watkins, 1984). Body mobility is a complex chain of events involving the nervous and musculoskeletal systems, which work together to produce movement in various parts of the body (Watkins, 1984). Movement of the body takes place around freely movable joints, and involves a multitude of systems using bones, muscles, tendons and ligaments. Physical disability can affect any part of this or the central nervous system resulting in a restraint in range of motion.

Clothing must work with the body's movements during the course of a day, expanding and contracting in a similar way to the body. If clothing impedes the normal range of body movements, physical and mental fatigue can result (Watkins, 1984). Clothing can be made more mobile in relation to an individual's specific needs by either varying the construction or by using materials that facilitate certain kinds of movement.

All individuals, with or without a physical disability, have a slightly different range of gross motor skills necessary for donning and doffing clothing and small motor

skills impacting dexterity in manipulating fasteners (e.g., zippers, buttons). (Watkins, 1984) suggests that when starting to design clothing that will aid mobility, the designer should “gather all the available information possible about the individuals and the activity involved. Then the body movements that are observed can be translated into garment specifications” In order to organize the wide variety of mobility issues affecting people with different physical disabilities to aid in clothing research, a dedicated classification system is necessary which directly addresses these mobility issues.

A more concise, distinct classification system is needed to help clothing designers systematically group physical limitations into manageable and mutually exclusive segments. Systems have been developed by Yep (1977), Reich and Shannon (1980), and Newton (1984-85) to address the clothing needs of the population and to guide and organize research in this area. In the late 1970s, data describing the specific disabilities of distinct groups was collated for use in the broader context of disability (Yep, 1977). For example, Yep (1977) thought it sensible to review conditions present in the nature of several disabilities, to identify commonalities and thereby form groups with similar needs. Home economists and rehabilitation professionals (i.e., the primary researchers in this area at the time) would be able to categorize individuals with similar needs and distribute information on clothing solutions according to individual needs.

Yep’s classification system was based on a refinement of the psychomotor domain taxonomy (Harrow, 1972). The psychomotor domain taxonomy addresses motor ability, extending from basic gross fundamental movements to skilled fine motor control. This taxonomy was reworked by Yep to suit clothing issues as follows:

1. Basic fundamental movements based upon reflex movements, including resistance to movement or body stiffness, large motor movement, and simple small motor movement.

In addition, conditions of special movement, such as wheelchair confinement, wearing of braces, and use of crutches.

2. Perceptual abilities enabling the individual to interpret stimuli and adjust to task or environment. This includes body awareness, sense of balance and visual discrimination, all of which have implications for dressing.

3. Physical abilities including endurance and strength, both needed for dressing, and control over incontinence and drooling.

4. Skilled movements involving complex motor manipulation, leading to complex dressing techniques such as shoe lacing.

Nevertheless, this system has been criticized because it creates complex groups of dissimilar handicapping conditions which do not create similar clothing and dressing needs (Reich & Shannon, 1980). Categories created by Yep do not appear to be mutually exclusive (e.g., category one and category three could overlap) which suggests that further clarity could improve Yep's system. Reich and Shannon (1980) proposed a simpler system based on empirical data obtained from approximately 300 Arizona residents with some type of physical disability (see Figure 2). The researchers developed a grouping of six common physical limitations across disabilities that would help address the clothing needs of a physically handicapped population. The causes of physical disability involved in this research were varied and included: arthritis (osteo and rheumatoid), congenital disabilities, trauma-related nerve damage and spinal cord injury. The information gathered about clothing and daily living needs led the researchers to believe that their classification system should span a number of disease categories that afflicted similar areas. One of the objectives for the study, to establish a database for the classification of groups of handicapped persons with similar common physical

limitations across disabilities, resulted in six groups being developed. The six groups were: lower leg, lower torso, upper torso, hand, arm, and neck (see Figure 2).

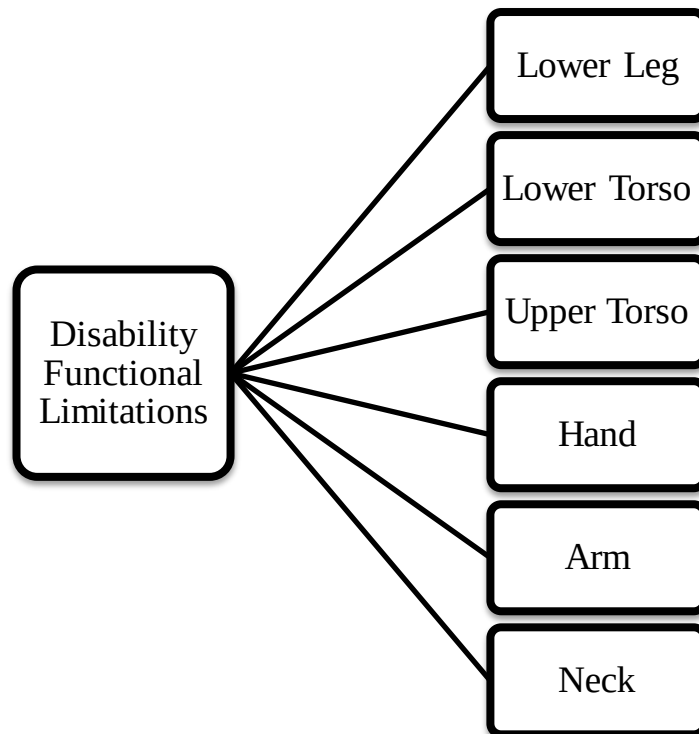


Figure 2 : Grouping Of Common Physical Limitations For Clothing Research. Adapted from “ Handicap: Commomn Physical Limitations And Clothing Needs” By Reich And Shannon's ,1980, *Journal Of Home Economics*.

Reich and Shannon suggested that the most effective categorization for clothing design is not one that defines groups by the cause of disability, but one that classifies the limitations by parts of the body affected, so that common solutions to a problem can be found. Two people might exist with different disabilities, for example, yet have similar functional limitations, and thus benefit from one clothing solution. The Reich and Shannon solution was a positive step forward for clarifying areas of concern, not only because it related mobility to clothing in a direct way, but also because it addressed other non-mobility issues. This appeared to be a more effective solution than Yep's (1977), which grouped by mobility only, because problems other than mobility might exist. Limitations included: (a) few types of disabilities were used to generate the categories,

(b) the categories might be too broad for clothing application, and (c) some areas of the body might be left out. Newton (1984-85) developed taxonomy for independent living to classify previous clothing research. The post-hoc research method served to organize existing work into three domains but did not attempt to provide a framework for an in-depth analysis. Newton adapted Bloom's (1956) domain taxonomy which groups research into three categories or domains; the cognitive, which contained preferences and needs, awareness, education, design and sizing; the affective, which contained attitudes, body image, and self-concept, and the psychomotor, which covered motor skills, but with little expansion useful to clothing studies.

This taxonomy provided a good starting point to classify existing research. Whereas Yep (1977) and Reich and Shannon (1980) provided extensive segmentations to relate to clothing solutions. The disability scheme put forward by Reich and Shannon (1980) appeared to have some merit for use in addressing clothing problems and solutions, as it placed areas of the body and limitation problems into separate distinct categories, easily understood by designers and product development personnel with little medical background or in-depth understanding of specific types of disability.

Another possibility of classifying disability for use with clothing research is presented by the Enabler system (Mueller, 1996) (see Figure 3), it defines disabilities as combinations of limitations in various parts of the body. This system has been in existence since the 1970s for use in ergonomic design, architectural design, changes to built environments and other type of product design, but has not yet been used for clothing. The purpose of the Enabler is to simplify the medical aspects of disability and make them more comprehensible to designers. The Enabler system is an effective way of defining specific limitations in an initial data gathering phase to determine extent of limitations within the body.

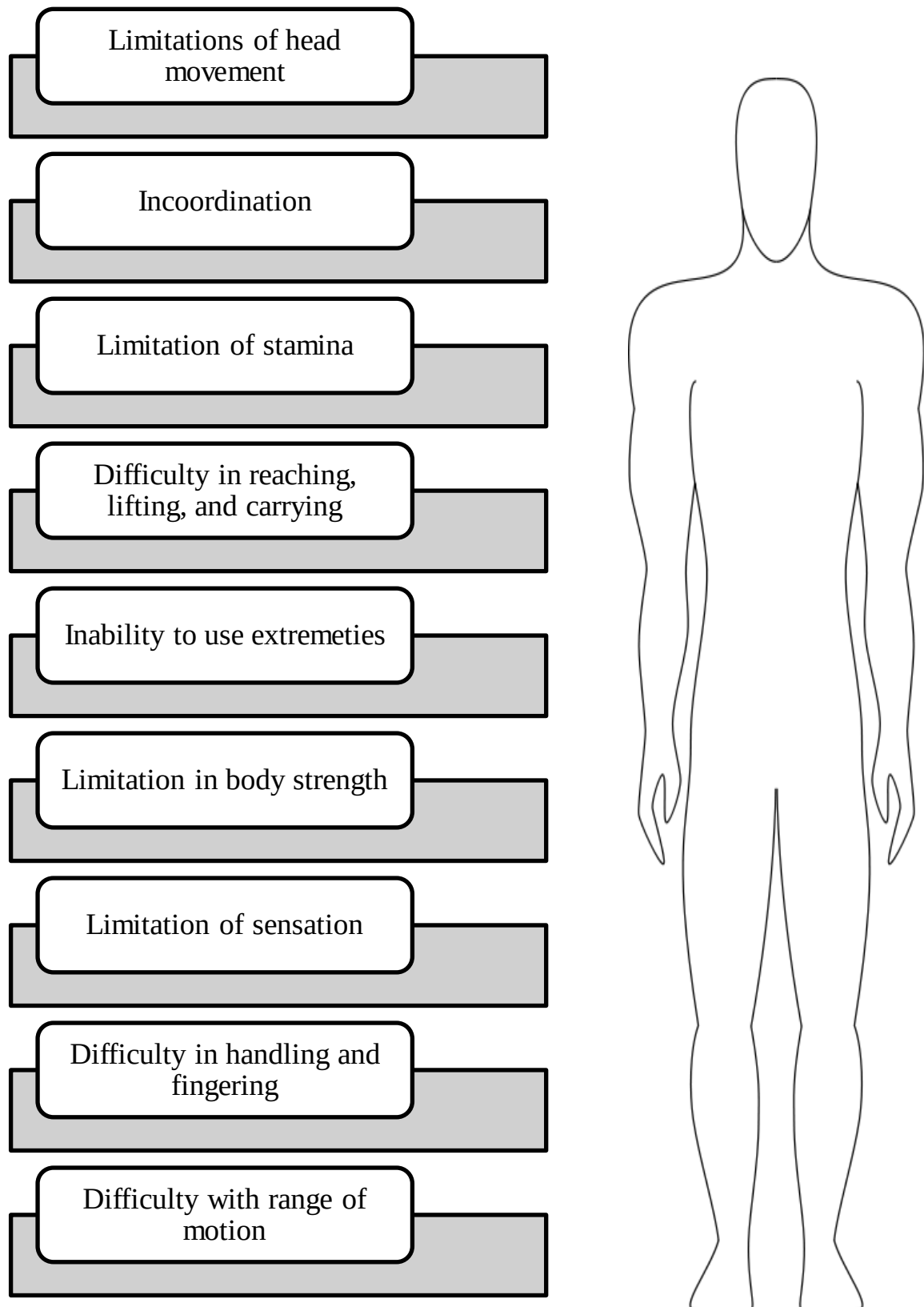


Figure 3 : The Enabler figure adapted to this study. Adapted from “ Universal Design : Creative Solution For A.D.A by Null, And Cherry ,1996.

2.04 Clothing Research for People with Physical Disabilities

This section reviews existing research on clothing for individuals with physical disabilities to date. An historical overview is given for studies carried out in the 20th Century. Initially clothing was first used as a self-help or rehabilitation tool for young children by medical and rehabilitation professionals and the User base was expanded to include adults with many different needs. Much of this early research was conducted by physical therapists, caregivers and the individuals themselves. The pattern of literature after about 1970 is refined from a general overview to more distinct conceptual categories, as researchers shifted focus to the social and psychological needs of the users and acquisition problems.

Rehabilitation of individuals describes a process whereby an individual participates in improving a quality of life that has been diminished in some way by a disability. Today, during a patient's rehabilitation, a rehabilitation team including occupational therapists, rehabilitation nurses, physical therapists and counseling psychologists work together to ensure reintegration of the individual as a complete human being (Kottke, 1982) and to improve quality of life. Counseling psychologists, work evaluators, and teachers help to reintegrate the individual into society and then train or retrain individuals for a productive life. Ruston (1977) identified clothing as an important tool in the rehabilitation process because it facilitated the mobilization of joints and muscles, and provided practical goals in the process. The idea of clothing as a rehabilitative tool dates to the 1930s. In children's hospitals for 'crippled' children, doctors, therapists, and nurses found that the acts of dressing and undressing improved the physical and cognitive skills of children with disabilities (Hoffman, 1979). As rehabilitation gained momentum as a necessary component of integrating a person into

society, more sophisticated studies were carried out. In the 1940s, a change in philosophy involved an increase in the teaching of independence skills (Cardwell, 1947; Dillingham, 1948), and clothing was a key factor for independence training. Research focus was changing from dependence to independence. In the 1950s, charts were used as teaching aids for handicapped children in hospitals to show them how to dress independently. Concurrent with these efforts, Mary E. Brown (1951) conducted independent research on the therapeutic value of clothing for teaching self-help skills, and started to work on special clothing designs for children with cerebral palsy to aid in skills development. At the University of Connecticut, Eleanor Boettke investigated the development of self-help clothing for children (1956) and their parents (1957).

Researchers then turned from using existing clothing as an independence tool to addressing the specific clothing problems of people with physical disabilities. In addition, during this decade, a call for increased research in Home Economics in general was made by the U.S. Department of Agriculture for extension purposes (Hallenbeck, 1966). Some investigators in clothing extension services committed themselves to exploring the needs of adult hospital and rehabilitation patients. They did this by identifying and developing aids for patient comfort, grooming, and dressing. Appropriate clothing for a broader range of 'groups', including handicapped homemakers and people with varying body types, was investigated. The identification of 'good' functional features in ready-to-wear clothing became an important research topic, and many instructional booklets were issued by extension agencies advising how to choose and alter commercial clothing and patterns (Boettke, 1957; Davis, 1955; Scott, 1959). The thrust of research by the end of the 1950s was still to achieve independence through clothing by developing new types of clothing. A pioneering organization in this research was the Institute of Physical Medicine and Rehabilitation in New York, where Helen

Cookman was appointed to investigate clothing problems of handicapped patients (Hallenbeck, 1966). Cookman's objectives, however, went further than just helping people achieve independence. She was concerned about producing good quality and fashionable clothing for this group of adults and wanted to see items developed and tested prior to potential ready-to-wear distribution. The result of her research, after a three-year period, was a specialized line of clothing for men and women with physical disabilities. The line consisted of 17 garments, which were trial tested and then redesigned. Fabrics were mostly easy-care nylon, and the clothing items were constructed with durable techniques. Six of the designs were subsequently produced by a nonprofit organization, Clothing Research, Inc., of New York City. Cookman's research, instead of changing the focus to fashion concerns in this area, resulted in the development of another self help booklet, *Functional Fashions for the Physically Handicapped* (Cookman & Zimmerman, 1961), which included detailed clothing adaptations and the rationale of each adaptation to the overall design. In the late 1950s, Clarice Scott of the U.S. Department of Agriculture Research Service conducted an in-depth survey on clothing with 70 homemakers with various types of physical disability (Scott, 1959). Their primary disability was ambulatory, but hands, arms and shoulders were involved. The survey resulted in a compilation of the respondents' clothing likes and dislikes with respect to various styles and design features. Important factors used as guides in Scott's survey were comfort, convenience, safety, protection, serviceability, fabric and attractiveness. A government bulletin was published (Scott, 1961) that contained designs for approximately 20 women's garments, with pictures, and pertinent details about clothing construction. Three dresses, three blouses, three skirts, an indoor wrap, a bolero jacket, slacks, shorts and pedal pushers, four aprons, a dress protector and two pockets were described in detail. This was probably the first attempt to target a

specific group of women in a 'functional' role and develop new clothing styles for them. All of the garments in the booklet were appropriate for the 1950s homemaker and her daily activities. In the early 1960s, extension home economists pioneered much research, with the focus still centered on independent living and self-help through functional clothing. Some states published extension bulletins to provide information to assist physically handicapped individuals. One of these was the Clothing News and Research Findings bulletin developed by Bernice Tharp (1964) at the Pennsylvania State University. Apart from extension services, small businesses started to focus on production of clothing for specific needs. For example, Mrs. Van Davis Odell founded Fashion-Able in New York in 1965, a business that designed and marketed undergarments for ambulatory women with disabilities. The line of undergarments came in standard sizes and included bras, girdles, slips, robes and pajamas. The business was founded on the personal needs of Mrs. Odell, who had suffered a cerebral aneurysm, which had paralyzed her left side. She subsequently had difficulty finding suitable underwear products. When she started the business, she could find no marketing research about her target customers, so she concentrated on her own needs, discovering that many others had similar problems. The business was successful, and was later expanded into a full line of women's clothing and other items, with all products available by catalogue. Much pioneering work was completed in Cleveland, Ohio during the 1960s, at the Vocational Guidance and Rehabilitation Services, a local rehabilitation agency (Hallenbeck, 1966). The head of the sewing department, Dorothy Behrens, at the request of nursing home administrators, began producing special back opening dresses so that elderly patients would not always have to wear hospital-type gowns. In 1964, a 'Specially Designed Clothing Service' became a permanent part of the Vocational Guidance and Rehabilitation Service with Behrens as director and designer. A mail-order

catalogue was eventually produced, including a measuring chart and a price list for over 40 garments for women, men and children. The items included dresses, skirts, blouses, coats, slacks and shorts.

In addition, during the 1960s, there were an increased number of seminars and conferences focused on clothing needs for individuals with physical disabilities. The unique aspect of these group sessions was their interdisciplinary nature. Home economists, rehabilitation workers, social service workers, as well as professionals from the Department of Health, Education and Welfare, gathered for the first time as teams with a common goal of

“...restoring the handicapped to productive family and community life and to define the need for research and education programs” (Hoffman, 1979).

An increase in output of theses and dissertations from major research universities focused on specific needs of individuals with varying levels of physical limitations. For example, some groups that were the subjects of study included: handicapped children (Friend, Zaccagnini & Sullivan, 1973; White & Dallas, 1977), elderly people (Phipps, 1977), homemakers with disabilities (Schwab & Sindelar, 1973), and young people with curvature of the spine (Warden & Dedmon, 1975). A percentage of this work, following the Rehabilitation Act, focused on helping therapists use clothing as a rehabilitation tool. The latter part of the 1970s included research papers of reflection and self evaluation, as well as new directions for home economists who practiced research in the field of clothing for the physically disabled.

Two conferences, one held at Virginia Polytechnic Institute and State University in 1976 and the other at the University of Alabama in 1977, provided forums for an interdisciplinary audience to explore not just the physical but also the psychological and social aspects of their work. Position statements were written evaluating current research

and projecting future directions for study. The focus was towards a more in depth view of the problem of ‘functional’ clothing, which would provide a theoretical basis for future research.

2.05 Social and Psychological Aspects of Clothing

Susan Kaiser (1990), in her landmark book, *The Social Psychology of Clothing*, elucidates four established theories of why people wear clothes: for *modesty*, to conceal parts of the body, for *immodesty*, or sexual attraction, for *protection* and for *adornment*, which she describes as “appearance modification for purposes of display, attraction, or aesthetic expression”. Kaiser, Freeman and Wingate examined the reasons why clothing and personal appearance plays an important role in the daily lives of a small sample of students ($n=36$) with physical disabilities. The findings of this study are reflected in Kaiser’s later (1990) text (see Table 3). Reasons found by Kaiser et al. included: concealment, deflection (to another body attribute less discrediting than their disability), compensation (“expressing mastery in an area usually closed to disabled persons”), and emphasis of the social uniqueness of the subjects’ situation (uniqueness of disability). An obvious parallel exists between reasons in both works. *Modesty* (Kaiser) parallels *concealment* in disability study. However, *immodesty* (reason in Kaiser) does not seem to have a parallel in the earlier work, unless *deflection* or *compensation* (Kaiser et al.)

Table 5 :

Reasons for Wearing Clothing as Described in Researches

Kaiser (1990) (text book) non disability	Kaisar, Freeman & Wingate (1995) (research study, $n=36$, with disability)
Modesty	Concealment
Immodesty	Deflection
Protection	Compensation
Adornment	Emphasis

The adornment or decoration theory is generally accepted as the primary reason why people of most cultures first wore clothing (Tortora & Eubank, 1998). Clothing as adornment can be used as a mechanism to lessen the effects of visible differences in the body and to emphasize other aspects of the self (Kaiser, 1990). This explains *deflection* and *compensation* in the disability study mentioned above. Kaiser discusses adornment as a tool that enhances personal appearance and thus builds self-esteem and psychological well-being. Simply put, the reasons people with physical disabilities use clothing as adornment are to enhance appearance and self-esteem. This self-esteem component was first explained by Anna Creekmore (1963) in her findings from a survey of 300 college women. Since Creekmore's study, the focus of many studies (Caldwell, 1999; Kaiser, Freeman & Wingate, 1985; Liskey-Fitzwater, Moore & Gurel, 1993; Nisbett & Johnson, 1992) has been clothing as enhancing appearance and self-esteem. Research in the social/psychological context has been approached in two ways: individuals with physical disabilities' perceptions of their clothing needs, and their attitudes to the role of clothing, and external perceivers' (e.g., able-bodied students, employers, and rehabilitation personnel) view of the clothing situation. Studies have used either physically disabled individuals or non-disabled individuals as subjects, or have used both groups as two variables within one study. Researchers have also explored how demographic variables such as age, sex, occupational status, and ethnic background affect the outcome of these studies.

In summary, in a review of research studies on physical disability and appearance, Lamb (1993) explored aspects of the literature related to appearance management for people with physical disabilities and emphasized the potential of this literature to advance theory development and improve instruction about clothing for this population. She looked at a wide range of appearance-related research studies, primarily

from the 1970s, 80s and early 90s, which covered topics in both categories physically disabled people as self-perceivers and others as perceivers. She noted that by varying the type of clothing used and changing the contextual environment, the type of perceiver has been manipulated as an independent variable in previous research. Lamb concluded that for designers, any venture into design for this population must give the consumers what they want, taking into consideration how the wearers of functional clothing feel about themselves and how others might react to their appearance. Efforts should be made to improve aesthetic and fashion appeal and situational appropriateness for these products. Although developed from User-specific studies with small samples, many suggestions on suitable clothing features for the development of clothing products for people with physical disabilities have been tested and put forward.

2.06 Fusion to Present Research

After examining many research studies which had been conducted into the problems of the physically handicapped, and people after muscle weakness which has progressed to a point where independent walking is no longer within the power of performance, the researcher found out what had been done and was being done in the area of clothing. These research questions were shaped by this review of literature, consideration of the antecedents to the research findings, identifying research gaps and inconsistencies in the literature and through understanding of the context in which the research was carried out. This study can become a baseline for the students exploring functional designing of clothing. It has opened venues for marketing of a new product line. The output can also be a valuable addition to the medical professionals.

Summary: The aim of reviewing literature was to grasp the knowledge of the work done by other researchers under different settings. An attempt was made to create a

basis for the existence of the need of adaptations to serve special functions by first addressing the concepts of physical disability. Three classes of disability are mentioned to form larger categories on the basis of disease and its origin. Afterwards different schemes to represent propagation of the effects of physical disability, as these evolved in comparison to each other are discussed. These bring into limelight the importance of social factor of clothing. This was followed by explanation of impact of different physical disabilities on choice of clothing. An important grouping of common physical limitations is given which paved way for more strategic researches in the field of adaptive clothing enhancing the functions each incorporated adaptation performs. It proved most effective categorization for such clothing designing. Another possibility of classifying disability, the Enabler system, which was used in many clothing researches is presented. This was also integrated to the current study. Next section is a historic overview of the studies in the area of adaptive clothing carried out in the twentieth century. First it was used as a self help and rehabilitation tool for young children by medical personnel and rehabilitation teams but soon the user base was expanded to include adults with many different needs. The shift in the literature after 1970, was sensed, it refined from a general overview to more distinct conceptual categories. The reason analyzed for this shift was new focus developed by researchers towards the social and psychological needs of adaptive clothing designs along with their functional attributes. Fusion of this review to present research is discussed at the end of chapter which led the researcher to derive research questions for current study.

Chapter 3

Methodological Perspective of the Study

The chapter research methodology describes the methodological approaches employed to explore research questions. The discussion is mainly focused on various aspects such as study design, selection criteria for study participants, sample selection, construction of research instruments, data collection, field work, measures adopted during development of questions to ensure these will dig out a comprehensive view during interviews to collect reliable responses and limitations and delimitations of the study.

3.01 Research Questions

Research questions narrow the purpose statement and become major signposts for readers of research, highlights Creswell (2002). Three research questions were formulated for the study. A prior interaction between the author and the context/participants of the study had also contributed to the formulation of research questions. The following three questions formed the basis of this research study and guided the development of sample, instrumentation, data collection and data analysis.

Research Question 1: What different areas of dress require adaptations for adult female patients of hemiplegia of grade 0 to 3 in Pakistan?

Research Question 2: What adaptations of clothing can be designed for adult female patients of hemiplegia of grade 0 to 3 in Pakistan?

Research Question 3: How effective the proposed adaptive clothing is for adult female patients of hemiplegia of grade 0 to 3 in Pakistan?

To fully answer the questions outlined above, specific objectives were developed:

1. Gather detailed information about specific physical limitations, clothing needs, and preferences from a sample of women who survived after an attack of hemiplegia of grade 0 to 3 in Pakistan.
2. Co-design three adaptive clothing solutions in light of data gathered in interviews and make a trial adaptive garment out of these designs.
3. Assess the success of the trial adaptive garment with the same sample of women using wear-testing and interview evaluation.

3.02 Study Design

A mixed method of inquiry was adopted for conducting this case study on adaptive clothing for adult female patients of hemiplegia of grade 0 to 3 in Pakistan. The purpose of this study was to understand and explore deeply the possibilities of making suitable clothing for women suffering from physical disabilities due to hemiplegia. The three approaches to research are quantitative, qualitative and mixed methods. They contain philosophical assumptions about knowledge claims, strategies of inquiry and specific research methods. The choice of research design is always appropriate to the subject under investigation (Patton, 1987) - based on the research problem, personal experiences, and the audiences for whom one seeks to write (Creswell, 2002).

Quantitative research designs are characterized by the assumption that data, evidence, and rational considerations shape knowledge. Qualitative research designs are those that are associated with interpretative approaches, from the informant's point of view, rather than measuring discrete, observable behavior (Jones, 1997). It refers to any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification, some of the data may be quantified as with census data but the analysis itself is a qualitative one (Strauss & Corbin, 1990).

Neither quantitative, nor qualitative method, however, is superior over the other, for each has its own strengths and weaknesses, especially when considered in relation to a particular problem. Halfpenney (1994) however, mentions that there is some polarity between the two methods; where quantitative approach is described as hard, objective and rigorous; the other is considered to be soft, subjective and speculative. At the same time, many researchers have shown that both the approaches may complement each other (Burgess, 1984; Zelditch, 1971) and may be integrated in the practice of social research. Mixed methods research has thus come of age (Creswell, 2002). The situation today is less quantitative versus qualitative and more how research practices lie somewhere on a continuum between the two. Recognizing the fact that all methods have limitations, biases inherent in any single method can also neutralize and cancel the biases of other methods. Instead of methods being important, the problem is most important, and researchers use all approaches to understand the problem (Nau, 1995; Jayaratne, 1993). Although this study had a mix method design but due to the in depth investigative mode of study the dominant approach of this case study was qualitative in nature to achieve objectives of research.

3.03 Assumptions, Limitations, and Delimitations

Inherent in every research study are two parameters, delimitations and limitations that establish its boundaries (Castetter and Heisler, 1977). Research therefore, often struggles with the questions of “what my case is” and “where my case leaves off”. Miles and Hubberman (1994) describe a case as a phenomenon of some sort occurring in a bounded text. The case, in effect, is commonly referred to as the “unit of analysis”. As has been mentioned earlier, this research confined itself to the study of adult female patients of hemiplegia of grade 0 to 3 in Pakistan

3.03.01 Assumptions.

The researcher assumed that all participants in the study were capable of determining needs of clothing choices, were capable of communicating their needs and preferences to a third party, and were able to evaluate a finished trial garment by oral communication.

3.03.02 Limitations.

The study was concerned exclusively with adult female patients in Pakistan who were affected with hemiplegia of grade 0 to 3. The study was conducted with such hemiplegia female patients in the Lahore. The study was completed in limited time duration of 6 months. The element of time and resources dictated the need to limit the number of interviews and the time and method of collecting information from study participants. Hence, participants may not have had enough time to thoroughly cover each question and therefore meaningful information may have been unnoted. This study does not attempt to exhaustively explore the problems of clothing for all adult female patients of hemiplegia of grade 0 to 3 in Pakistan. Due to the small, purposive sample of participants in this study, the results are only applicable to this sample or to others with similar characteristics and are not generalizable to any larger group of individuals with similar condition.

3.03.03 Delimitations.

Some delimitations were proposed for this study. Only adult female hemiplegia patients after the management phase of the disease hemiplegia of grade 0 to 3 from one locality of Lahore were selected as study participants. Only non institutionalized patients were selected. The group of women acting as participants in this study was representative of the physical conditions with which each woman was personally

affected. Only structural styles and designs of clothing were considered and design options for Shalwar, and Shirt were probed. Only three adaptive clothing design options (drawings) for shirt and only one adaptive clothing design option for shalwar was suggested and out of these only one shirt and shalwar of adaptive clothing design options was constructed for wear trial.

3.04 Study Population

The population for this case study was adult female patients of hemiplegia of grade 0 to 3 in Lahore, Pakistan. According to the objectives of the study no institutionalized patients were considered. Locating the appropriate population (according to the specified grades of muscular strength) was quite difficult to find as they are very scattered and no one place could be located where the concentration of specified population is confirmed. Reach was made possible by contacting few patients under treatment of a physical therapist. The socio psychological barriers manifested in such women due to hemiplegia made it very difficult to approach them with ease. Prevailing situations of law and order also became a hindrance in contacting such people directly. Appropriate study population was only approachable after providing a couple of references before contact.

3.05 Study Sample

3.05.01 Sample Size.

In view of limited resources and time constraint, for this case study three participants were selected as sample under the supervision of a qualified medical physical therapy specialist of hemiplegia in Lahore. Availability of the resources in terms of time, funds, competency of researcher and transportation were important factors

considered while deciding sample size. The sample from population was selected after the management phase of disease so all participants were non-institutionalized. The physical disabilities suffered by all were closer to each other as purposively female patients of hemiplegia of grade 0 to 3 were targeted (see Table 6).

3.05.02 Sampling Technique.

Keeping in view all the factors mentioned above a Purposive convenience sampling methodology was adopted for this research. Sample of women were drawn using a snowball method Snowballing is an appropriate method of obtaining participants whereby a set of participants is recommended to the researcher by word of mouth (Babbie, 1991). A famous local medical specialist of hemiplegia was contacted to solicit participation from patients under his treatment, who might be eligible. Women who were chosen to participate in the study received brief information about the current study and manners in which their valuable input was required (see Appendix A). This size represented a non probability sample, useful, according to Babbie (1992), when one may wish to study a small subset of a larger population in which some members of the subset are identified, but the enumeration of all of them would be nearly impossible. In this case, a non probability, small sample was most effective means of obtaining the depth of information required. Same group of women were included in the wear-test evaluation.

Table 6 :

Description of Study Participants and Their Grade of Muscular Strength

	Participant	Age	Grade of hemiplegia
1	01	44	Grade of muscular strength is 2
2	02	39	Grade of muscular strength is 0
3	03	55	Grade of muscular strength is 1

After formal inclusion of sample from population, a meeting was set with each during which researcher distributed a brief research detail and consent form (see Appendix A) to ensure that the participant understood and was willing to participate in the study.

3.06 Data Collection Strategy

The methods employed for research included interviews with a medical specialist to develop an understanding of disease, this was augmented by in-depth interviews of the patients themselves to illuminate basic elements of changes required in clothing and to develop better understanding of the context of their physical limitations. The needs expressed by the patients were the basic criterion for the designing of adaptive clothing ideas of this study. Intent of study was also to suggest solutions that can bring a change in quality of life of the participants, for that an intervention was planned to determine effectiveness of one proposed solution out of the co-designed proposals. Conclusions were drawn in light of responses of same group of participants as the relief they experienced after using the trial adapted clothing. The viability and necessity of integrating intervention and interviews has been advocated by a number of social scientists (McCall & Simmons, 1969; Reiss, 1968; Vidich & Shapiro, 1955). The primary data was collected through in depth interviews. It was believed that the needs, problems, and preferences of the three study participants were somewhat representative of the entire population of Pakistani adult female patients surviving from similar symptoms of hemiplegia of grade 0 to 3.

3.07 Instrumentation

All instruments were constructed by the researcher for this study after reviewing the existing literature (see Appendix B). These were given to the experts to determine their validity.

After incorporating expert's comments these were pretested to determine convenience and practical feasibility in administration of these instruments.

3.07.01 Description of the Instruments

Three instruments were used to gather data from study participants. Table 7 shows a complete listing of instruments and their functions.

Table 7 :

List Of Instruments To Be Used In Each Stage

	Objective /Phase	Instrument	Title	Description
1	One	Instrument I Section A	Body Limitations.	Partial Enabler figure, physical limitations ranking matrix.
2	One	Instrument I Section B	Clothing Problems & Body Measurements.	List of potential clothing problems & measurement chart.
3	Two	Instrument II Section A	Sketch Development.	Line drawing from basic dress bodice and adaptations.
4	Two	Instrument II Section B	Specification Sheet.	Detail of all sizes and details of adaptive design for construction.
5	Three	Instrument III	Wear-Test evaluation.	About potential clothing problems.

Note. All instruments can be found in Appendix B

Instrument one (see Appendix B1 & B2) was used to gather information from participants for first phase of study which was about assessment of needs for adaptations required in clothing. Section A of Instrument one was adapted from the Enabler figure (Null & Cherry, 1996) to gather information about body limitations that might impact clothing issues. Nine areas of potential limitations were identified from the literature.

These areas were (a) in- coordination, (b) limitations in body strength, (c) limitations of head movement, (d) limitations of stamina, (e) limitations of sensation, (f) difficulty in lifting, reaching or carrying, (g) difficulty in handling and fingering, (h) inability to use extremities, and (i) difficulty with range of motion of body.

Each of these physical limitation areas was listed, with definitions provided on a second page (see Appendix B1). On the right side of the physical limitation listings was a matrix, which plotted each physical limitation area against a Likert-scale ranking of zero to four. The rankings are designed to assess the degree of difficulty with a specific physical limitation. Rankings were anchored at zero (not difficult) to four (impossible) and centered at two (difficult at times). The participants were asked to rank each area of physical limitation that applied to them and were also asked to give extra qualitative information which was recorded. These data gave the researcher expanded information into the particular nature of each participant's problem, which supported Objective One.

Section B of Instrument one (see Appendix B2) was designed to identify the nature of clothing problems for each and to link these problems to potential solutions, identified from previous literature. Nine potential clothing problems were identified and listed in a table. These problems were: (a) difficulty putting on and taking off (donning and doffing) clothing, (b) difficulty managing fastenings (e.g., hooks and eyes, zippers, buttons) due to restricted use of hands and lack of mobility, (c) lack of freedom of movement for a variety of activities (e.g., crutch walking, sitting in a wheelchair), (d) inappropriate and uncomfortable style, (e) inadequate coverage of the body, (f) some features are irritating and get in the way, (g) styles of clothing can be constricting and uncomfortable especially during temporary changes in size (periods of weight gain and loss), (h) construction quality inadequate for stress exerted by user, and (i) not all

clothing solutions are aesthetically pleasing. Likert-type rankings were provided that quantified the degree of difficulty of each potential problem.

Rankings were anchored at zero (not a problem) to four (impossibility) and centered at two (problem). The qualitative input of participants was also recorded to be used in the analysis phase while creation of design solutions. For each potential problem participants also provided their comments about dress features which could most adequately provided solutions to their clothing problems. This served the purpose of combining a functional solution with a personal choice based on traditional and casual style preferences.

The researcher and the participants worked mutually on details. A measurement chart was included in this section (see Appendix b2), which was used to record measurements of the participants to be used for the construction of trial garment. The measurements recorded were bust, waist, hips and center back. The researcher recorded the measurements using a tape measure in both centimeters and inches. These sets of measurements were used in construction of trial garment.

Information gathered in Instrument one section A and B was interpreted for use in Instrument two (see Appendix B3 & B4) for co designing of three adaptive clothing designs. Information produced from each participant's interview was analyzed; the ideas given by all participants were consolidated into three complete sketches of adaptive clothing designs. Standard pattern blocks were manipulated by the researcher to achieve the adapted styles. During the process of making these sketches opinion of participants was collected again. The input of participants helped a lot to finalize all the details of each design idea. After this phase of co-designing and completion of details of every adaptive clothing design in line sketching one design was chosen with the help of participants to be constructed for wear trial. The instrument two section B (see Appendix

B4) consisted of a specification sheet. This specification sheet served to combine the selected design and body measurement sets gathered in Instrument one so that trial adaptive garment could be constructed for every participant.

“It is usually possible to save a great deal in sample-making time and money by properly analyzing a sketch before the sample is made” (Solinger,1996).

Details for the construction of a trial adaptive garment were shown in specification sheet. The details shown were about (a) drawing of style line (b) sketching of adaptation in detail , (c) details of dress measurements for each participant according to the corresponding body measurements obtained in previous stage. From this specification sheet three sets of trial adaptive garment were made for each participant accordingly. These were then provided to each participant for wear trial of three weeks. The co-designing phase ended with the construction of the three sets of same trial adaptive garment made in three different prints of same material in required size of each participant.

Instrument three (see Appendix B5) consisted of wear-test evaluation sheet. It comprised an evaluation questionnaire, used to gather information from the participants after a wear-trial of three weeks duration. Each Participant was provided with three sets of one adaptive garment design matched against their personal measurements. After the time that the participants completed wearing the trial adaptive garment for three weeks, the researcher asked them to rate features of the trial adaptive garment using a three-point Likert-type scale anchored at one (worse than I envisioned) to three (better than I envisioned), and centered at two (just as I envisioned). Participants rated each of the clothing problems from Instrument I used in the initial interviews. The format of the scales was derived or adapted from the literature (Huckabay, 1992; Prevatt, 1991;

Rainer-Jeanes, 1994). This phase concluded with interview questions relating to overall relief felt by the participants.

3.07.02 Construction Of The Interview Questions.

The present study was designed to collect data through interviews and observations, the questions were pre structured in such a manner that no gap of information was left .Social scientist's deal with human behavior, which are most sensitive in nature. More careful and intelligent measures are required to get information from them. In such cases like need assessment of adaptive clothing where the information was required on sensitive subjects, researcher required extra careful handling of the participants. In such studies it was quite essential that during development of interview questions, all aspects of data quality and human nature were taken into account.

During development of the interview schedules, the questions were constructed to obtain consistent, reliable and true response as well as cooperation of the respondents. Maximum care was adopted to avoid sensitive, threatening and embarrassing and double barrel questions. Similarly special attention was paid to enhance the element of clarity. Extra care was adopted that contents of interview questions must respect the cultural norms, values and belief of the people.

3.07.03 Sequence of the Questions.

The sequence of the questions in the questionnaire was of worth significance as it might attract or detracts the attention of the respondents. A natural sequencing of the questions yielded reasonable level of respondents' cooperation as well as quality information. A good strategy of asking easy questions first followed the difficult one was adopted during the development of interview schedules. Similarly, the social, economic,

and demographic questions were placed in the beginning of the interview while those on determining areas of dress causing problem in the middle. In view of this, questions on the desired change were placed at the end of the interviews.

3.07.04 Coding.

The coding of the questions at the time of questionnaire development is considered very useful approach in the social sciences research. The pre-coding saved both time and efforts. It helped researcher during interviews, on-spot editing, and all the subsequent stages of data processing and management. Special attention was paid to ensure that coded categories were completely encompassing the required set of information. Open-ended responses were coded at the time of data management.

3.07.05 Time and Relevant Questions.

The time required to complete the interview was of vital importance. In the present competitive world time is wealth and nobody can afford to waste the time. It was quite essential to avoid lengthy questions, which consume much time of the respondents and even the researcher. Efforts were made to keep the questionnaire as short as possible to avoid tiring the respondents. In view of this, unnecessary questions were not included in interview schedule construction and only those which were required to explore the study objectives, were incorporated. About forty to fifty minutes time was taken by the researcher to complete the interview. Comprehensive understanding of the questions played vital role in acquiring reliable and meaningful responses from the respondents.

3.07.06 Pilot Study or Pre-Testing.

A field work was conducted to check the sensitivity and workability of the questions. Another objective of this pilot study was to ensure that participants really understood the questions and they yielded true response. The ambiguities encountered

during this trial and error stage were carefully rectified on revision and modification of the interviewing schedule. Questions were rephrased in the light of the pilot study.

3.07.07 Validity of the Instruments.

Validity must address the question of whether the measures used during the study will accurately “...reflect the *real meaning* of the concept under consideration” (Babbie, 1991). The instruments to be used in interviews were developed from various aspects of the literature. By incorporating an adapted version of the Enabler model to describe type of physical limitations (see Appendix B1), the instrument for this interview format “closely reflect(s) the world being described” (Rubin & Rubin, 1995), a necessary criterion for validity in qualitative research. The Enabler model is an accurate and useful way of translating medical problems into design solutions in the building and arts field (Null & Cherry, 1996). Section B of Instrument I (see Appendix B2) was developed from the literature on clothing for people with disabilities and recorded information about proven problem areas taken from fifty years of research. In instrument II (see Appendix B3), allowing the participants to co-design the adaptive clothing designs with the researcher provided validity in that the sketch represents the true wishes and needs of the participants. The specification sheet (see Appendix B4) developed from the selected sketch of the trial adaptive garment after interviews was a valid method of communicating various dimensions of a garment (Solinger, 1988) It provided communication about the engineering of a garment through the garment development and manufacturing stages. Components of the specification sheet were selected from industry texts (Glock & Kunz, 1990; Solinger, 1988; Tate, 1989; Giddings, 1999). Wear testing evaluation (see Appendix B5) involved having the participants try the trial adaptive garment for three weeks to assess how it corresponds with the nine clothing problems from the initial interviews. This related the trial adaptive garment directly back

to participant needs and preferences, and helped to determine whether each of the participant's specifications was satisfied by the trial adaptive garment. This ensured that the trial garment followed participant needs criteria determined during participant interviews, a process deemed important by several researchers (e.g., DeJonge, 1984; Giddings, 1982; Lamb & Kallal, 1992; Thoren, 1997) in their original framework for the design process established that during the evaluation stage participant needs should be reassessed to evaluate if the trial garment satisfied participant needs. Every aspect of the participant interview questions was interpreted and evaluated. By developing assessment questions from the literature, validity was maintained through this stage of the study.

3.07.08 Reliability of the Instruments.

Reliability must be present in a qualitative study to ensure that the study is replicable (Creswell, 1994). Instruments one, and three (see Appendix B1, B2,& B5) contained detailed questions, which were also described to participants while interview to successfully complete the instrument. In addition, pilot testing was performed on each of these instruments to ensure clarity and ease of use. Instruments one and three were pilot tested by two women with disabilities to check for clarity of questions and to determine length of time required to complete the instruments. A basic garment bodice was used for the co designing pilot study, to enable the researcher to check for clarity and ease of use of Instrument two (see Appendix B3). To aid reliability in the design stage, the final sketches and specification sheet (see Appendix B4) which incorporated participant design choices were completed and verified by a faculty expert in apparel design.

The researcher made the trial adaptive garment, which was a result of data collection in early stages of the study, but became an instrument for participant evaluation in wear test. The researcher had 16 year's experience designing and

constructing clothing products to specifications for individuals. An expert in clothing design and a medical physical therapy specialist of hemiplegia evaluated the suggested adaptive designs to ensure these addressed participant needs and preferences, and evaluated the trial garment so that it followed the original design and specifications.

3.07.09 Some Other Measures For Ensuring Data Quality.

As pointed earlier, social sciences deal with human attitude and behavior that are changing over time. It is quite essential for the interviewer to keep record of the activities during interview in a covert or overt manner. Happening of any major or minor incidence could influence the fieldwork.

The recording of all such events greatly assists investigator during editing of the questionnaires, data management and finally in producing a good report. The researcher recorded the comments of the respondents on the pages in every questionnaire accordingly to her convenience. Similarly, she also recorded other important information, which helped the researcher during report writing. The participant's body language, explanation of events and comments by the participants during interview and their life style provided useful information.

3.07.10 Field Supervision.

The unique feature of the social sciences research is that it deals with human attitude and behavior, which vary from individual to individual and are on changing with slight change in the circumstances. Proper care of the element of reliability and validity during question development, combined with proper conduct of interview enhance response rate to the higher degree. During the entire fieldwork, the researcher exercised every effort to create conducive and pervasive environment for conducting interviews

effectively. Creation of a conducive environment was vitally important for meaningful and reliable responses

3.08 Method of Data Collection

The study was conducted with support of a qualified physical therapist treating hemiplegia patients. Three participants suitable for the adaptive clothing research were identified with the help of the doctor. No patient was forced to participate. Individual and family permission was obtained prior to the patient's inclusion in this adaptive clothing research. Formal permission was sought from the concerned personnel to conduct the study. The understanding of the medical situation of hemiplegia preceded since the underlying clothing problems arise from this particular medical situation and the knowledge of this helped to develop a basic approach to the clothing requirements of the participants.

The research comprised of data collection in three phases to meet the given objectives of study. Data were collected first about the participant's physical limitations, clothing choices and body measurements, second to co-design some adaptive clothing solutions, and third about the evaluations of the trial adaptive garment

The phase one of this research focused at feedback provided by selected sample about identified areas of dress requiring adaptation through in depth interviews and observations. Phase one began with interviews in which data were collected from participants about their physical limitations (Instrument I, Section A), the nature of their current clothing problems and their choice of solutions (Instrument I, Section B), body measurements were taken (Instrument I, Section B). The researcher recorded responses to all sections in the charts provided in the instruments. Data collection during in depth investigations and interviews was also audio taped to aid in later transcription of interview notes.

Results of phase one led to phase two that was co designing of adaptive garments. Designing of suitable clothing adaptations was carried out keeping in mind the need of adaptations assessed in phase one of this study. After examining the needs of participants the ideas most practical and functional were suggested in drawings which were modified from the basic dress block of flat pattern designing (Instrument II, section A). Construction and location of openings, number and type of fastenings, and design of garments for comfort and ease of movement were carefully considered in these sketches. Specific clothing adaptations were subsequently developed by the researcher herself with help of co designing input of study participants. Out of three co designed adaptive clothing options for shirt only one was selected to be constructed as intervention to determine the effectiveness of co designing efforts. Phase two continued with the formal presentation of one selected sketch for trial adaptive garment in a specification sheet (Instrument II, Section B) and construction of it.

Phase three focused the last objective of study that is evaluation of effectiveness of one trial adaptive garment provided to participants to use for duration of three weeks to determine effectiveness of adaptations imparted. Each participant was given three sets of one adaptive clothing style in three prints of same fabric; assessment of fabric was beyond scope of this research. For determination of effectiveness an evaluation sheet (instrument III) was used. The study participants were interviewed in detail according to the questions in evaluation sheet. Data were recorded by the researcher. Data collection was also audio taped to aid in the data transcription process.

3.09 Data Analysis and Interpretation of Findings

In qualitative research interviews, the taking of notes during data collection actually begins the simultaneous processes of data collection and analysis (Creswell, 1994) because the researcher is immersed in the process as it takes place (Merriam,

1988). Typically, in qualitative studies, data analysis takes the form of coding. Coding represents the operations by which data are broken down, conceptualized, and put back together in new ways (Strauss & Corbin, 1990). For this study, coding categories, which sometimes emerge during thorough analysis of the data by an open coding method, were pre-determined according to the framework used to guide the interview and evaluation processes and to construct the instruments; therefore, the researcher's role was to place participant responses into predetermined categories. By becoming part of the process in this way, the researcher was beginning to analyze data while collecting information from participants.

In all Phases of the study, data were collected from participants using semi-structured interviews. After the interviews, field notes and audiotapes were transcribed into written documents. Transcriptions were read carefully by the researcher in order to become familiar with the data and to 'clean' the data. The data was then segmented into separate units of analysis, it was then re contextualized, which entailed linking the units of analysis with common meanings into categories or themes. This process of evaluation and decision-making during data analysis was used in this study to place data into the relevant categories. In addition to the textual interview data, some quantifiable data of rating scales were analyzed.

The researcher herself translated the data in pre determined codes and themes, to be used in the subsequent stages of data analysis and report writing. The data collected in the form of observations and interviews were content analyzed. The collected data were thematically grouped to interpret the outcomes of the study (Gay, Mills, & Airasian, 2006). For the first phase the analysis was directed towards assessment of real locations on the dress where adaptation was required. Analysis of the features developed in the literature, opinion of the participants, and the current clothing styles resulted in co-

designed sketches. Preference was given to incorporation of functional features over stylistic features due to the objectives of the study. Features favored by the participants in the interviews were incorporated into these adaptive design options, along with preference of participants for styling. These suggested co designed sketches were then analyzed by the researcher for consolidating the information provided in the interviews to arrive at one selected design out of three proposed designs for constructing a trial adaptive garment. The specification sheet was used as a guide for construction of the trial adaptive garment, which was wear-tested by the same participants. For the final phase the content analysis of the interviews and observational analysis described how the change was experienced by patients after using trial adaptive garment made according to their specific needs for three week duration. A cross case analysis was also conducted. Due to the small sample size, no other statistical tests could be run on this group of data.

Summary: The chapter research methodology described the methodological approaches employed to explore research questions. The discussion was mainly focused on various aspects such as study design, selection criteria for study participants, sample selection, construction of research instruments, data collection, field work, measures adopted during development of questions to ensure these dig out a comprehensive view during interviews to collect reliable responses .Limitations and delimitations of the study were also given providing boundary to the work. Strategy of data collection and data analyses was also discussed in this chapter.

Chapter 4

Data Analysis and Interpretation of Findings

Multiple methods of instrumentation and analyses were used for this study. Multiple steps were taken in searching for results from data obtained from group of participants, and multiple types of information were obtained during study. Three proposed research questions guided the development of sample, instrumentation, data collection and finally data analyses of this mix method research project.

4.01 Phases of the Study

The study followed a linear progression of data collection and analysis. The study was divided into three phases

Phase one (research question one and objective one) focused on gathering data from participants to provide the necessary information for need assessment of this specific group of users of adaptive clothing.

Phase two .(research question two and objective two) focused on co designing of adaptive clothing, the information obtained from the study participants in phase one suggested a guideline for sketching adaptive clothing design which were most suitable for the specific needs assessed The designing phase was also interactive and participants were asked to make their opinion while the sketches were in initial stages. The completion of detailing of the sketches was out come of co designing efforts of researcher and study participants.

Phase three (research question three and objective three) aimed at wear testing of one trial adaptive garment. Out of three suggested adaptive clothing designs of phase two, one was selected to be constructed as trial adaptive garment. The selected design was developed for construction with help of a detailed specification sheet containing

final dress measurements for each participant, detailed line sketch of design and its accessories. This specification sheet facilitated the construction process. Three sets of this trial adaptive garment, made according to corresponding measurements, were provided to each participant. Wear-testing of the trial adaptive garment took place with same group of participants and information was collected about their experience after three weeks of use.

4.02 Phase One : Need Assessment

Detailed results of phase one are provided in this section. Both individual and aggregate data are presented. Information was gathered from a group participants ($n=3$) concerning (a) types of physical limitations, (b) clothing needs and preferences, and (c) body measurements.

4.02.01 Physical Limitations – Overview.

Phase one began with a search for a sample of Pakistani women surviving from attack of hemiplegia of grade zero to three (research question one, objective one). Help of a medical physical therapy specialist was sought to reach and obtain the required sample. Three participants agreed to volunteer for study. All participants had limited body movements and needed assistance while dressing. During data collection and analysis, participants were identified only by numbers from 01 to 03. Participants presented different degrees of physical limitations due to hemiplegia attack (see Table 6). The researcher conducted semi-structured in-person interviews with participants at their residences. Instrument one Section A (see Appendix B1), an adaptation of the Enabler figure (see Figure 3), was used to determine their degree of physical limitation in various functional areas. Participants were asked to assign a rating to each area using a five point Likert-type scale, ranging from ‘no problem’ (0) to ‘impossibility’ (4). Results are given

in Table 8. Participants were asked to give a full description of problem areas rated (1) or higher. The researcher made written and audio recordings of responses.

Table 8 :

Participant Response About Degree Of Their Physical Limitation For Different Body Areas

		0	1	2	3	4
	Area of Physical Limitation	No Problem	Potential Problem	Occasional Problem	Problem	Impossibility
1	In coordination	0	0	0	1	2
2	Limitations in body strength	0	0	0	2	1
3	Limitations of head movement	0	0	0	2	1
4	Limitations of stamina	0	0	0	1	2
5	Limitations of sensations	0	0	0	2	1
6	Difficulty lifting, and reaching	0	0	0	0	3
7	Difficulty handling and fingering	0	0	0	0	3
8	Inability to use extremities	0	0	0	2	1
9	Difficulty in range of motion	0	0	0	1	2
10	Others	3	0	0	0	0

Note. Greatest problem areas shown in bold type

In light of the disability classifications discussed in Chapter Two (see Table 1, 2 & 3); this study was concerned only with the functional limitations of developmental disability due to hemiplegia. Table 8 shows the frequency results of Instrument one Section A for participants for ten areas of physical limitations. Each of the ten areas was identified from the Enabler figure (see Figure 3) and by a medical physical therapy professional as common physical limitations in patients of hemiplegia of grade 0 to 3. In a pilot test of this section of the instrument, a medical physical therapy specialist confirmed the applicability of each area to the study. The greatest problem areas were assessed by determining the number of respondents who rated them as a problem or greater. All areas were identified as features of concern from the participants.

4.02.02 Types Of Physical Limitations – Details.

The qualitative descriptions that follow describe each physical limitation and its rating as reported to the researcher during interviews. Areas of physical limitation were defined clearly in the instrument one section A (see Appendix B1) according to descriptions provided with the Enabler figure (see Figure 3).

IN COORDINATION (AREA 1). All participants gave in coordination (lack of body coordination) a score higher than zero on the rating scale. In coordination has been described in the literature as lack of large muscle coordination (Yep, 1976). The participant one (01) considered that in coordination was a problem as her physical conditions had become progressively worse. Participant two (02) rated in coordination as constant problem. She had difficulty coordinating every detailed work with her fingers which also related to difficulties handling and fingering. Participant three (03) had unvarying difficulty with motor skills and carrying out detailed work with her fingers. For these participants, the problem was worse in one side of body because only one side

got badly affected by hemiplegia. This neurological disorder caused weakness, numbness, paresthesia, and pain in their hand, ankle and foot. Due to weakness in their hand and foot, they had problems coordinating movements in the rest of their body, cannot coordinate movements behind them or to their side.

In summary, in coordination, as interpreted by three participants in this study, seemed to affect their' control over their body extremities in performing fine and gross motor skills, which also affected handling clothing and fastenings. In coordination was also interpreted as affecting overall balance and equilibrium, which in turn affected some movements related to donning and doffing and also to the wearing of clothing. In coordination was also close to create difficulties in handling and fingering skills.

Limitations in Body Strength (Area 2). All participants gave the category of body strength a score greater than zero. Two participants (01, & 02) indicated that body strength was a problem. Participant (02) stated that her upper body strength had deteriorated as her disease progressed and physical conditions worsened. She experienced burning sensations in the muscles across her back. She reported that these sensations were getting less over the past few months as she performed exercises promoted by her physical therapist. Participant (03) had very little strength on her right side and could not lift any thing, she had very little strength in her hands and arms. Body weakness for these three participants involved the full length of the arms and legs (including wrists, hands, ankle, and feet), shoulder, neck , upper and lower back.

The participant's limitations in these areas have implications for donning, doffing and wearing clothing. Endurance and strength had been identified as being necessary for dressing (Yep, 1976), it had been used as variable which impacted aspects of clothing in other literature also.

Limitations of Head Movement (Area 3). All participants gave limitations of head movement a score greater than zero. Two Users (01, & 02) considered head movement to be a problem. Participant (01) was having problems moving her head to the right and turning it quickly to either side, so that she had to guard against moving her head to the side and could no longer touch her chin to her shoulder. Participant (03) had head movement limitations in moving to the left or right side and could only turn her head about halfway towards her shoulder on either side. Up and down movements were currently not possible for her. Head movement for all was a problem when sideways movement was involved to the right or left, towards the shoulder. This limitation had implications not only for donning and doffing clothing but also for the styling features of garment around the neckline area. Usage of head movement as limitation was also found as a separate issue in clothing literature.

Limitations of Stamina (Area 4). All participants gave limitations in stamina a score greater than zero (see Table 8). Participant (01) stated that stamina limitations were dependent largely upon the type of activity at this stage of her disability. She stated that stamina was a by-product of Hemiplegia stroke, and if her routine was disturbed she became run down and was not able to sustain any sort of activity. She described how she did not have the endurance to perform any sustained activity due to fatigue. Example were using the computer or to get a glass of water and not being able to lift it. Participant (02) explained how stamina was dependent on whether she was feeling well on a particular day. If she was not feeling well she knew she did not have the stamina “to get her self together” and did not do anything that day because of the efforts needed to get dressed. Participant (03) considers stamina to be major and consistent problem because she had symptoms of hemiplegia of grade one. She also got fatigued because she had to spend the day in some kind of pain. She felt that her stamina

problems were worsened. She had been experiencing tiredness, headache, dizzy spells, and a tremendous amount of pain. She had also been excessively thirsty and had high blood pressure, blood sugar and cholesterol levels. Her stamina was limited in many tasks. For example, she took about an hour to get dressed. She had given up many tasks because she got fatigued easily.

For all these participants, stamina was reported to the researcher as a problem dependent upon several factors including activity (dependent on type of activity), severity level of disease, environment (climate), and occasion (good days and bad days). Common symptoms of lack of stamina included loss of sleep, getting run down and running out of energy, not being able to complete a task without resting at intervals, and not being able to perform tasks at all. A limitation in stamina was an area taken from the Enabler model (Null & Cherry, 1996). According to the participants, lack of stamina impacted donning and doffing and the type of clothing that was worn and styling that allowed for easy movements.

Limitations of Sensation (Area 5). All participants gave this area of limitation a score greater than zero. Two participants (01, & 03) had a major problem associated with sensation. Participant (03) was experiencing increasing numbness in her extremities. She viewed this numbness as a threat. She could not move without considerable difficulty. Participant (02) considered sensation to be a problem. She was limited in sensation in her body. She also had a band of pain that went around her chest from her spinal cord to the breast bone. The amount of sensation she had and degree of pain she could withstand varied daily. Limitation in sensation for these participants encompassed numbness in the extremities, sensitivity to humidity and cold, and hyper-sensitivity of the skin in some parts of the body.

These limitations had implications for the manipulation of clothing and fastenings, the type of fabric used in a garment (e.g., warmth factor and texture against the skin) and the construction of the garment (e.g., the amount of layers built into a garment). Numbness in the fingers affected the ability to apply pressure to fastenings and to handle a garment during the donning and doffing processes, and hyper-sensitivity of the skin meant that the garment had to be made with a fabric that did not irritate, and provided necessary heating and cooling effects.

Difficulty in Lifting and Reaching (Area 6). All three participants had difficulty in these activities, as they had difficulties lifting and reaching objects, due to lack of strength. All participants, therefore, gave similar score to the best of their judgment. Participants found all the activities in this area impossible to perform. They could not lift anything because they had no strength. The area of limitations of lifting and reaching limitations had implications for dressing and for the type of fastening that might be applied to a garment, together with the location of the fastening. These limitations were taken from the Enabler model (Null & Cherry, 1996)

Difficulty in Handling and Fingering (Area 7). All participants gave this area score of four. This category dealt problems with fine motor movements such as manipulating small fasteners, jewellery and hair ornaments. All specified handling small items due to limited ability in grasping and picking things up as major problem (participant 01, 02, & 03). Participant (01) mentioned that she knew what she wanted her fingers to do but was not able to make them work. Participant (03) had to get help to do ordinary tasks, such as adjusting her headscarf because her fingers did not have the sensitivity to be able to manipulate objects. Participant (02) had pain and numbness in her left side and was not able to grip anything for any length of time. She regarded this

limitation as a problem that was worsening with age. She found all movements very difficult in her left side.

Handling and fingering was a problem for all participants due to insensitivity, numbness, and/or pain in the hands and fingers, which led to limitations with fine motor skills and referred pain in the body. This condition had its implications for clothing fastenings, and manipulating fabric while donning and doffing. Handling and fingering in relation to clothing was previously found to be of concern in handling fastenings as well as certain styles of dresses (Moran, 1976; Reich & Otten, 1991; Schwab & Sindelar, 1973).

Inability to Use Extremities (Area 8). Two participants (01, & 02) gave body extremities inability a score three, and one participant (03) had given score of four with this area of limitation. She previously experienced confinement in bed and the inability to use all extremities, but “worked her way back” to being almost fully functional in left limbs. However, she felt that, as she aged, she might lose the ability to use her extremities. She had no strength in the right triceps muscles, which led to difficult lifting, reaching and carrying. All participants expressed difficulty in mobility due to lack of strength in the extremities of the affected side.

The inability to properly use the arms and legs is an important factor for the design of garments. A limitation in this area affected donning and doffing, because the arms shoulders and legs were typically used during these movements. It also affected the styling of clothing because of necessary accommodations for the lack of arm, shoulder and leg movements (Kernaleguen, 1978; Reich & Otten, 1991; Schwab & Sindelar, 1973)

Difficulty with Range of Motion of Body (Area 9). Participant (01) gave this limitation a rating 3. Two participants (02, & 03) considered range of motion to be a major problem because they thought that their symptoms to have trouble moving arms over head and behind back, and turning their head to side would worsen with age in this category. Problems with range of motion for these participants were focused on limited movements of both arms from the shoulder to the fingers and limited movements of the head and neck and limitation of leg, knee and hip movement. These conditions were reflected as not being able to sustain a position of arms either behind or above head for any length of time, lacking the ability to reach to the side or behind the back using arms.

As in previous areas of limitations, these problems affected donning and doffing, and the shape and styling of garments to accommodate for lack of range of motion in the extremities. Limitations also affected fastening systems and their locations. A certain range of body movement was suggested conceptually as necessary to don and doff clothing, manipulate fasteners, adjust clothing once it is on the body, and move around comfortably (Watkins, 1984).

Other (Area 10) .No participant reported additional limitations to the researcher.

4.02.03 Types of Physical Limitations – Discussion.

The researcher interpreted a rating of two (occasional problem) or more as a current problem area; therefore, any area where participants rated the area a two or more was considered of significance importance to the remainder of the study. The interviews revealed all areas to be significant areas of limitation. Limitations in endurance and strength and skilled movements involving complex motor manipulation had been identified by Yep (1977) as part of a classification system suitable for clothing issues.

4.02.04 Clothing Needs and Preferences – Overview.

During initial interviews, all participants ($n=3$) also responded to Instrument I Section B (see Appendix B2) which assessed the severity of specific problems with clothing. Nine dimensions of clothing problems (see Appendix B2) had been determined from previous research (e.g., Behrens, 1963; Frescura, 1973; Kernaleguen, 1978) to be the most commonly occurring clothing problems for people with physical disabilities.

Table 9 :

Participant Response about Clothing Needs and Preferences

		0	1	2	3	4
	Clothing Dimensions	No difficulty	Potential difficulty	Occasional difficulty	Difficulty	Impossibility
1	Difficulty donning and doffing clothing	0	0	0	2	1
2	Difficulty managing fasteners	0	0	0	1	2
3	Lack of freedom of movement	0	0	0	0	3
4	Inappropriate and uncomfortable fabric	0	1	2	0	0
5	Inadequate coverage of body	0	0	0	1	2
6	Style can be constricting and uncomfortable	0	0	0	0	3
7	Construction quality inadequate for exertion of stress	0	0	0	0	3
8	Some features are irritating	0	0	0	3	0
9	Not all clothing is aesthetically pleasing	0	0	0	0	3

Qualitative responses added by participants were presented for each dimension, but these were not participant specific, except for their quotes deemed by the researcher to be of particular interest to the problem. For each clothing dimension, all participants ($n=3$) responded to every item. The clothing dimensions listed for the study were taken from the existing literature on this issue. These clothing dimensions were also in direct relation with the types of physical disabilities present in the individual. Out lining the required clothing needs and preferences of the study participants helped in narrowing down the desired adaptive features in the designing stage. When participants identified the severity of a specific clothing problem, they also described their ideal features in clothing suitable for them. Table 9 shows the response of participants for each problem.

Using the same analysis as for Table 8, any problem rated a two or more in degree of difficulty was considered significant. Four problems, 'lack of freedom of movement', 'styles of clothing can be constricting and uncomfortable', 'aesthetics' and 'construction quality' were reported by the entire sample as impossibility.

4.02.05 Clothing Needs and Preferences – Details.

Difficulty Donning and Doffing (Dimension 1). All participants gave this dimension a score greater than zero. Out of these two participants (01, & 02) described it as difficulty, some of these problems stemmed from having clothing that they considered "difficult", some problems were caused by pain and fatigue when performing the acts of donning and doffing clothing. "Difficult" clothing appeared to be that which was confining, did not open down the front, and was tight when put on or taken off over the head (constricting in donning and doffing). Fatigue and lack of stamina appeared to manifest the problem because on days when the participants were fatigued, donning and doffing became a greater problem. One participant (03) mentioned taking an hour to get

dressed every day because she had to alternate dressing with rest periods. She mentioned that she always got a shot of pain across her shoulders and down her arms when crossing her arms and pulling something up over head, making some aspects of dressing a painful task. All reported needing assistance from a member of their family on a daily basis to don and doff clothes. All the participants had problems with donning and doffing as they had experienced problems with all of the physical limitation categories (e.g., range of motion, motor planning , strength , stamina , sensory , and other). When translated into participant needs and preferences for clothing, these problems necessitated some type of opening to facilitate donning and doffing, preferably located at the front of the garment.

Difficulty Managing Fastenings (Dimension 2). All participants ($n=3$) had problem with fastenings. Due to the varieties of commercial fastenings available for clothing, this section had been organized and reported according to type of fastening to increase clarity in analysis.

Zippers were mentioned as a problem by all participants for various reasons, primarily due to restricted use of hands (e.g., motor planning, strength). Zippers located in the back of the garment were also a problem because all participants were either unable to reach around their body to manipulate the zipper. Other than eliminating the need for a zipper completely, solutions from the participant interviews had suggested using large metal zippers only, placing a large pull tab with a hole on the zipper so one finger was used to operate it, attaching a facing to prevent fabric and threads getting caught in the zipper teeth, and applying the zipper on that side of the garment which has easier access. All participants were in favor of these solutions.

Another frequently mentioned problem area for the participants was the use of *buttons* as fastenings. Buttons and buttonholes present problems because buttons become undone when participants turned around in their wheelchair or bed if the button was too

small for the buttonhole, the button was difficult to manipulate if it was too small, the button come off the garment if it was not very securely attached to the garment fabric, the buttonhole gaped if it had been sewn on vertically down the center front of a garment, buttons placed at the neckline, and too small buttons placed in one area were too difficult to manipulate and manage. Acceptable solutions for participants included making sure the buttons were larger than average buttons and were placed along the garment so the access and work load was easier, securing buttons so they stayed put during manipulation, attaching buttons with a long shank so they were manipulated more easily, undoing only a few buttons down the front or back of a garment so a minimum amount of buttons needed to be re-fastened, and making keyhole or diagonal buttonholes.

Velcro, a hook-and-loop fastening mechanism, was also considered a problem by the participants. Common complaints included the materials used in Velcro were too stiff and inflexible and not durable enough for daily needs. Velcro commonly came undone when used as a front closure; the materials were uncomfortable because the sharp corners dug in to the skin adding additional discomfort to the pain of the disability. Acceptable solutions included finding a new type of hook and loop fastener that was flexible, soft around the edges, stretchy and longer lasting, which in turn built consumer confidence in its ability to stay fastened at the front opening; using the circle type of Velcro instead of the rectangular strips; and placing it with a sensitivity to the varying needs of different areas of the body so that sharp edges did not harm.

Hooks and eyes were mentioned as impossibility by all the three participants. Problems included small size of hook and eye, position of hook and eye in the rear of the garment, and hooks and eyes becoming mutilated in the laundry process. Acceptable solutions included eliminating hooks and eyes completely for this population, making

them larger, and placing them in front as a closure so that they are visible while being fastened.

Another problem fastener type for this population was the *snap*. Participants perceived that snaps required more pressure by the fingers than they possessed. One participant (03) firmly believed that a completely new type of snap fastening is needed for this population because old snaps were outdated and had not improved over the time

General comments were made during the interviews regarding fastenings that did not relate specifically to any one type, which might impact the design of future adaptive clothing. General problems with fasteners were attributed to lacking hand-to-eye coordination, not being able to see the fastening, not having enough strength and time to manipulate fastenings, locating fastening on the garment with worst areas for all was in center back, not having enough stamina to work in a particular spot for any length of time, and having a combination of any of these problems. All members of the sample had problems with fastenings as they also had experienced problems with all six physical limitation categories (i.e., range of motion, motor planning, strength, stamina, sensory and inability to use extremities). General solution proposed by one participant included using a fake seam with a fastener underneath and putting fastenings where they were reachable – at the front or approachable side, but not at the back. Participants were already making adaptations on their own. For this study, the objective was not to create an entirely new type of fastening system but one that would work within the existing system; therefore, the design solution at this point was to utilize currently available fastenings. The optimal solution was to use a fastening that was usable by all members of this population, by making it big enough to manipulate and placing it on the garment where it can be most easily handled. This would help all people with similar limitations in the categories of motor planning, strength, and stamina.

Lack of Freedom of Movement (Dimension 3). Lack of freedom of movement was a problem for all of the participants (01, 02, & 03). The participant (01) considered this a problem and to solve it she used oversized dresses because they “hid a lot.” Darts and shaping of any kind were mentioned as problems by the all the participants. They also described heavy garments and garments that lie close to the neck as constraining movement.

Solutions for improving freedom of movement in a garment to satisfy all participants included creating plenty of ease for various physical abilities (e.g., by putting a gusset under the arm, making a raglan instead of a traditional set-in sleeve, eliminating darts), and eliminating style lines that interfered with movement (e.g., cutting fabric away from the neck area). Participants who identified lack of freedom of movement as a problem had all six categories of physical limitations as physical problems.

Inappropriate and Uncomfortable Fabric (Dimension 4). Participant responses were split between, potential difficulty, and occasional difficulty for his area of clothing dimension. Participants who rated fabric as a problem stipulated that the use of man-made fibers in the garment be kept to a minimum. They stated that fabric made from fibers such as polyester was not comfortable and that natural fibers “breathed” and looked nicer. One participant (02) was strongly against the use of any man-made fiber in a garment. She said “...if you are in a wheelchair in a polyester dress, by the end of the day you have a rash because the polyester doesn’t breathe.” Others considered a very small percentage of man-made fiber with a maximum of ten percent as an option to maintain a wrinkle free look. There was also an inconsistency in the way that wool was discussed among the natural fiber discussion. One participant stated she was not able to tolerate wool because of her perception and experience that it was scratchy and

uncomfortable against the skin and she was allergic to wool. Fabric construction was also an issue mentioned by participants in terms of preferences but not necessarily considered as a problem. “Slippery” fabric was also a problem. In general, washable fabric was mentioned by all to be useful because it was easier to wash, ironing was also problematic for this group of participants so that wash and wear fabric was preferable. In conclusion, fabrics were needed that were washable at home, that were soft to the touch but not slippery, that did not need to be heavily ironed, and that maintained their appearance throughout day without bringing discomfort to the wearer. This dimension was beyond the scope of this study as focus was developed only on structural features of adaptive garment construction.

Inadequate Coverage of the Body (Dimension 5). The researcher assumed at the start of data collection, that coverage of the body only related to modesty issues, based on previous literature (Behrens, 1964; Warden & Dedmon, 1975). After interviewing the participants, coverage for warmth was found to be another important concern. Two participants considered this an impossibility, but almost all participants had comments that they wished to make on this. Problems that related to modesty issues included sizing and measurements. Body measurements of such population were not the same as commercial standards; therefore, regular garments were too short in the body and not broad enough across the shoulders. Another problem was the use of specific types of mobility aids (i.e., crutches or wheel chairs), which raised hems and side slits about two inches up on the sides, exposing areas of the body. Solutions for the modesty issue suggested by both researcher and participants included slightly lowering the hem to make the garment longer than the regular, putting extra fabric in strategic places that allows for coverage of different body types. Participants also stated that warmth in addition to modesty was a problem. Inadequate blood circulation was to be blamed for

not maintaining adequate body temperature at certain times, and clothing did not usually keep them warm enough. For one participant (03) clothing that kept the body properly covered and did not let air pass through even on hot summer days, to maintain a comfortable body temperature, especially when confined to a wheelchair, was important. The participants who considered coverage of the body to be a problem with their clothing also had listed the categories of physical limitation range of motion, strength, sensory and other as problem areas.

Constricting Styles of Clothing (Dimension 6). All participants had major problems with constricting styles of clothing, which they explained in terms of their body parts. The results of this section were, therefore, reported according to areas of the body. Beginning with the top of the body, clothing problems began at the neck. Two participants mentioned not being able to have anything tight at the base of the neck. None liked having a tight collar up around the neck, they were unable to have any pressure across the back of the neck, especially from a garment neckline with a rib or tight edge to it. Next was problem with the bust line in that they could not have anything constricting around the bust; therefore, they did not wear bras and did not want constricting clothing in this area. For them, great importance was also attached to sleeves and sleeve openings that were neither tight nor constricting. At the waistline, plenty of room was needed. All designs had to be loose around the waistline or able to expand at least one size due to temporary changes in size. These problems were compounded when trying to find suitable clothing. Solutions to the problem varied according to every individual choice. V-neck and low round necklines were stated as being a possible solution to the neckline problem. Soft, lightweight and slightly elastic fabrics were mentioned as being popular because they did not constrict around the body. To accommodate the ease needed for the rest of the body, loose fitting style dresses were

mentioned as being acceptable as adaptive clothing. Participants also stated that elastic waistlines on Shalwar (without belt) were sufficient for their needs and they were not too worried for this part of dress. These participants reporting a difficulty with constricting styles of clothing in general had reported all categories of physical limitations to be problems.

Inadequate Construction Quality(Dimension 7).All participants (01, 02, & 03) rated construction quality as a major problem. They all thought that construction quality needed to be excellent for their specific needs but felt they were not able to find it in regular clothing. Participant (03) who considered this dimension to be a major problem was specific in indicating that she needed durable construction features such as double stitched and french seams with quality. Specific problems included wearing out the elbows of sleeves if sitting in a wheelchair, wearing out underarm seams, popping seams, losing buttons, disintegrating elastics, falling out hems, and failure of clothing in washing and stain removal. According to the participant's responses, quality of construction of any garment that they wore was a high priority. Construction of clothing needed to be durable, mainly due to the extra "wear and tear" that such women place on garments in stress areas (e.g., seams, fastenings). The challenge for this study was also to maintain the highest quality of construction. Participants mentioning problems with constricting styles of clothing also had experienced problems with all physical limitation categories.

Some Features are Irritating (Dimension 8).All participants consistently had problems with irritating features in regular clothing. As in the section on constricting styles, this section was reported according to garment areas corresponding to areas of the body because this was how the respondents chose to report their problems. All rated it a

problem. Beginning at the neck, virtually anything around their neck was irritating because they were not able to stand any heaviness at this area. Regarding opinion about a button and keyhole opening as the closure, this particular fastening was also difficult for them to manage but seemed to be the usual method of closure in regular clothing. Sleeves also presented some problems of irritation, sleeves that were too tight or too short and those that rode up the arm were considered a nuisance because they made the garment look ill-fitting and the made the wearer self conscious. Any constriction in the sleeve, sleeve seam, arm hoe or wrist, was not acceptable. At the wrist, the preferred option was to have no fastening or elastic and to make sure the sleeve was wide enough through which to slip the hand. These participants who had problems with irritating features also had experienced problems with all physical limitation categories.

Not All Clothing is Visually Appealing (Dimension 9). All participants considered visual appeal to be a major concern when looking for suitable adaptive clothing. All agreed that lack of good styling made one look “poor” and “sorry for oneself”. However, they were frustrated at non availability of suitable clothing options. This supported previous research, which found that people, with all but the most severe physical disabilities, place value on the aesthetic appearance of their clothing (Caldwell, 1999; Thoren, 1997), and that many functionally designed garments lack aesthetic appeal, and appropriateness (Freeman, Kaiser & Wingate, 1985-1986). One participant (03) shunned solid fabrics because they show stains. A major point made by all participants was that, if they could find something that worked well for them and was appropriate for their situation, they would like to have several pieces in the same style and in seasonal colors and fabrications. They commented that people with disabilities hated to wear a “uniform” of some type because, when “you have a disability, it becomes even more practical.”

Overall styling preferences tended to be for a loose and unfitted style of garment. Neckline preferences tended to be for a plain round neckline. Although some similarities existed in solutions, specific styling needs and preferences were varied. Drop or raglan sleeves were popular style choices, as were loose fitting sleeves. All generally discarded suggestions of details at the wrist (e.g., elastic and ruffles). One considered pockets necessary because they were not able to carry handbags; however, others didn't need these but were ready to accept these if part of the design. Preferred choice was small prints, a checkered pattern was also mentioned but only by one. The participants discussing problems with visual appeal had been experiencing problems with all physical limitation categories.

4.02.06 Clothing Needs And Preferences – Discussion.

Few problems, 'lack of freedom of movement', 'styles of clothing can be constricting and uncomfortable', 'inadequate construction' and aesthetics were reported by all of the sample as major problems. This finding suggested to the researcher that a priority in design development would be to design a comfortable, well fitting adaptive clothing style that had easy-to-manage fastenings and allowance for ease of movement. Comparing the results in Table 9 with the physical limitations in Table 8 demonstrates that participant's difficulties with handling and fingering might be the cause of difficulties with fasteners. Another problematic physical limitation area, lifting, reaching and carrying, might be linked to problems with constricting and uncomfortable styles of clothing. A lack of mobility required to reach with the arms would be compounded by constricting clothing styles. Comparisons to the other significant physical limitation areas, strength and stamina, cannot be made with either of the significant clothing problem areas, although they may affect donning and doffing

4.02.07 Body Measurements of Participants.

A component of Instrument I Section B (see Appendix B2) was the body measurement chart. Participants were measured by the researcher using a standard tape measure in inches and centimeters. The measurements taken were at the bust, waist, and hips (nine inches below the waistline). Measurements were taken in order to make the trial garment to the actual size of respondent. Table 10 shows results of these body measurements.

Table 10 :

Body Measurements Of Participants Taken During Interviews

Participants	Bust		Waist		Hip	
	Inches	Cm	Inches	Cm	Inches	Cm
01	36.50	90.50	31.0	79.0	39.0	99.0
02	40.0	99.0	33.0	84.0	44.0	112.0
03	41.5	105	38.0	97.0	45.0	114.0

4.03 Phase Two : Co Designing of Adaptive Clothing

According to the participants, if a basic style of garment was found to be acceptable, they were willing to use it in different colors and fabrics. The researcher therefore envisioned the input of participant information to produce three variations of adaptive clothing shirt designs in drawing and then selecting most accepted among these to be constructed for wear trial. Designing for adaptive clothing solutions in this study began at end of phase one with completion of Instrument I Section A, and B , which was part of the participant interviews for first phase of study.

The designers traditionally do not remain in direct contact with the potential users of the garments. In contrast, during the current study, potential users actively participated in the development of some adaptive design solutions to suit their needs. This process of co-design of adaptive clothing has been successful in previous research (Wu, Anderson & Ulrich, 1999). Study participants helped developing (i.e., co designing) three design sketches as the adaptive solutions of shirts. To start the co design process, front and back sketches of basic bodice block, were shown to the participants. This basic bodice block consisted of long, straight, set-in sleeves, a round neckline, bust and waist darts in the front, and waist darts in the back. These block patterns corresponding to basic fitting were used as templates in designing from which more complex patterns were made (Glock & Kunz, 1990). The researcher and participants participated to sketch features and style lines onto the basic sketches and change them to show features that resemble an adaptive style custom designed garment, (i.e., a final design sketch). Using the design ideas from individual participant interviews, the researcher put together three adaptive clothing design options, which accommodated a majority of features expressed by each participant to feel comfortable (functional features) and visually appealing (symbolic features). Including both types of features is recommended by Thoren (1997). The researcher had expected this section of the study to be challenging because of the different approach of each participant. But, in fact, the process of assimilating each participant's needs and preferences into three design options was easier than expected because of the similarity of the physical limitation categories and clothing needs and preferences. A prominent feature expressed by all was that solutions should be such that these would not make the wearer "stand out from the crowd" (i.e. the garment must not look like it has any 'special' disability features). This request by the participants was similar to findings by previous researchers (Caldwell, 1999; Kaiser, Freeman & Wingate,

1985; Liskey-Fitzwater, Moore & Gurel,1993; Wingate, Kaiser, & Freeman, 1986). Flat sketches of the adaptive clothing designs were drawn and are shown in Figure 4, Figure5, Figure6, and Figure7.

4.03.01 Main Features Of Adaptive. Clothing Design Options.

The preferred shape for all designs by all participants was loose and unfitted. They preferred a loose-fitting shirt because it gave them the freedom of movement necessary to accommodate their physical limitation. The length of the proposed designs (i.e., just touching the knees) was also preferred by all participants. This concealed certain areas of the body, which was also noted as a modesty requirement of Pakistani context. Two side slits allowed for extra flexibility, and the hem was slightly lower than the regular to allow for extra coverage while moving, a feature preferred by participants. The seams suggested were double stitched as this minimized the possibility of broken or frayed seams, mentioned in the interviews as a problem. All the suggested adaptive designs had no defined waistline because ease was a feature most desired by all the participants. At this area they did not want the restriction for example a fitted waistline.

Loose, long, and unfitted garments with no defined waistline area, with long, and loose sleeves and essentially a front opening were the resulting adaptive clothing features co designed by the researcher and study participants. This style was seen as acceptable for usual daily routine of the participants. The adaptive style sketch development completed in participant interviews confirmed that these were style with which all participants felt both emotionally and functionally comfortable in their daily life.

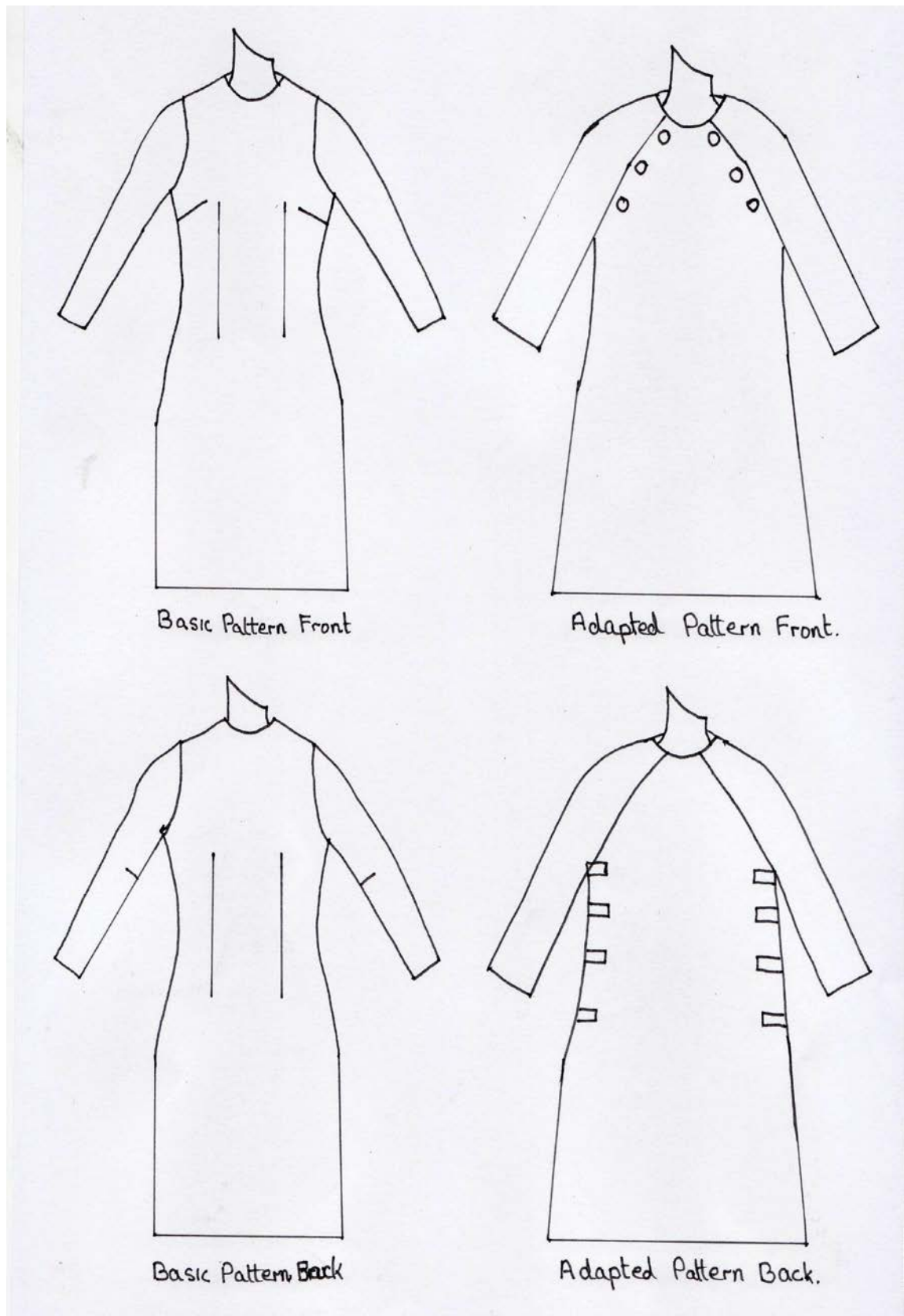


Figure 4 : Sketch Of Adaptive Clothing Co Designed Option One Developed With Participant Interviews.

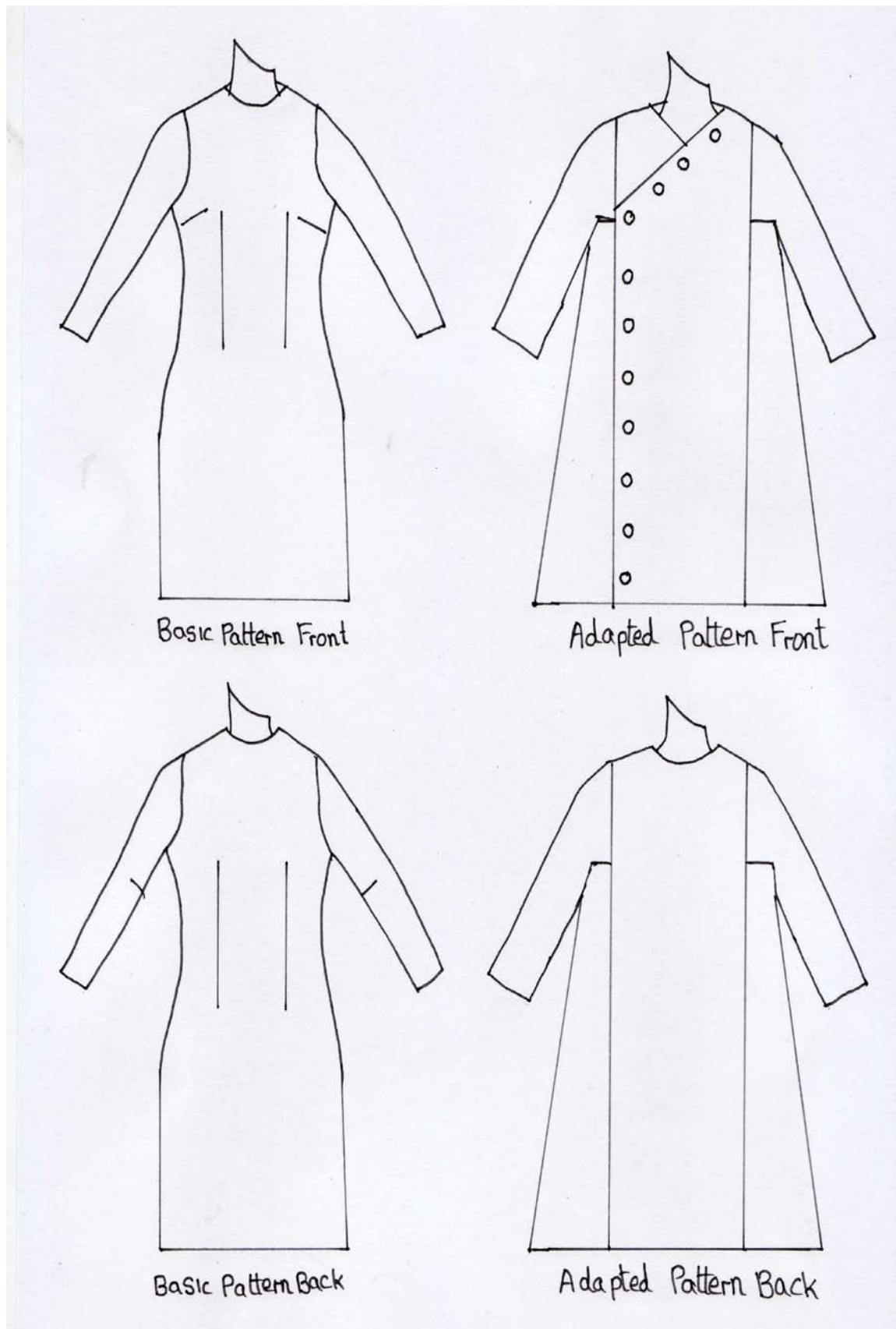


Figure 5 : Sketch Of Adaptive Clothing Co Designed Option Two Developed With Participant Interviews.

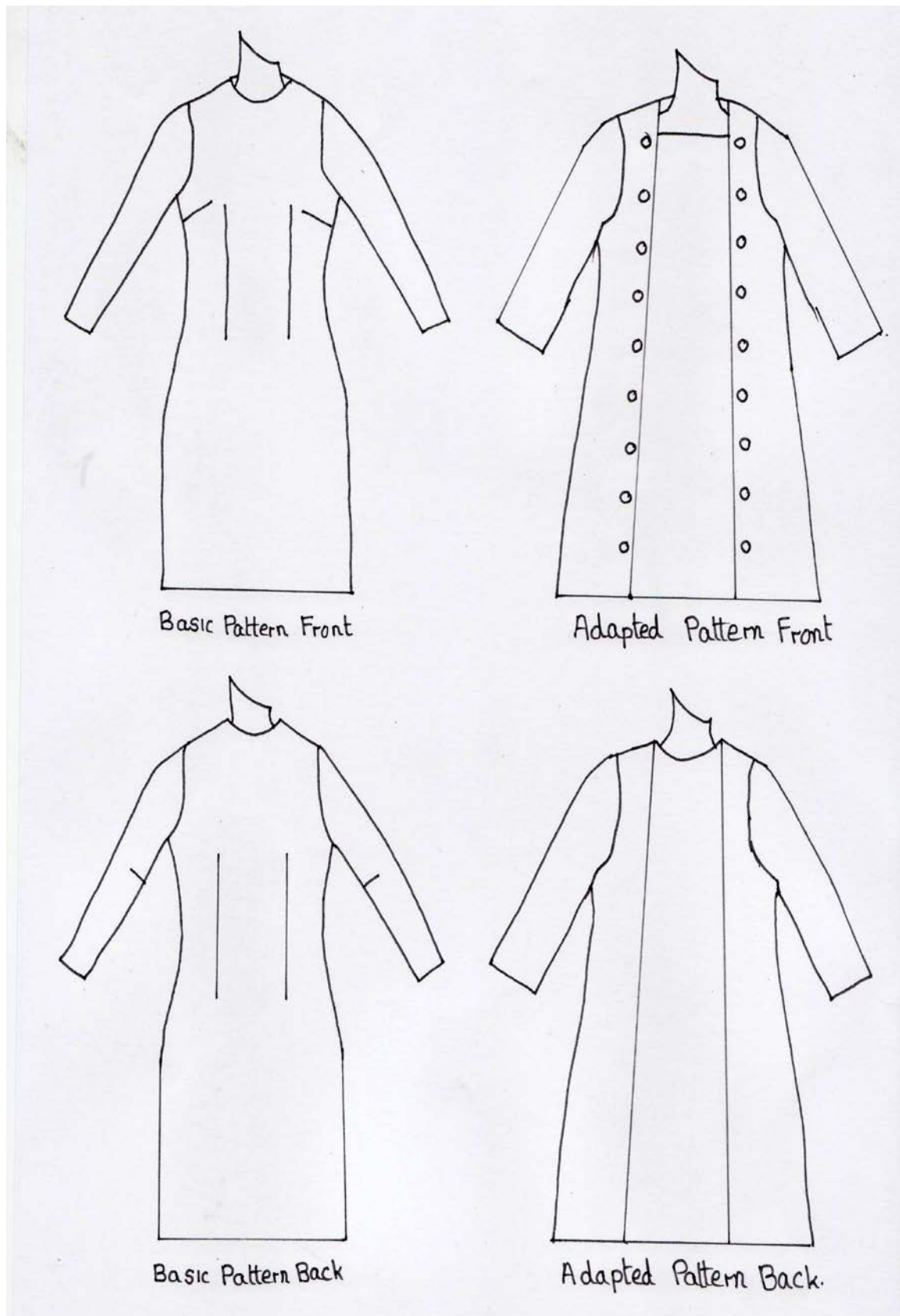


Figure 6 : Sketch Of Adaptive Clothing Co Designed Option Three Developed With Participant Interviews.

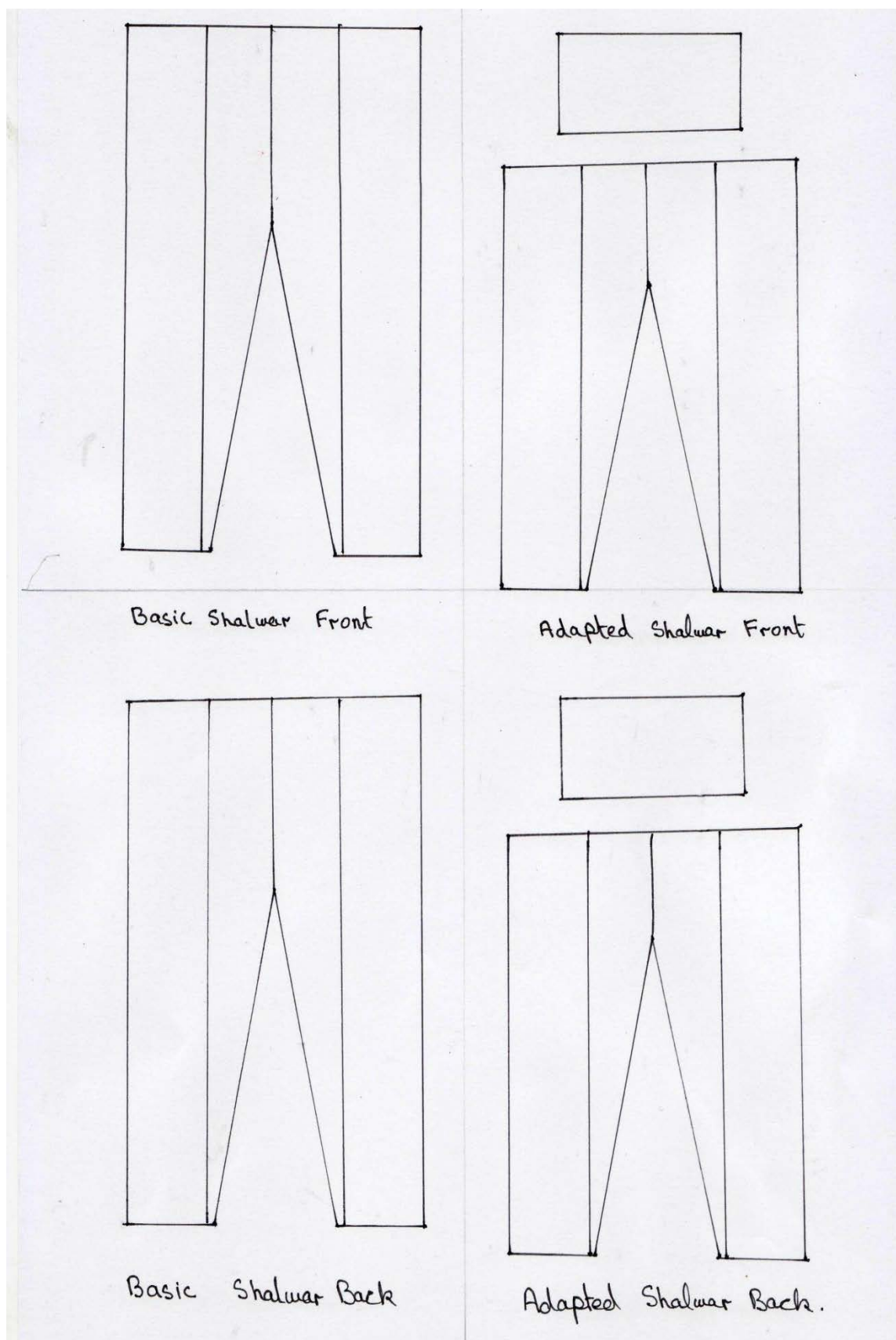


Figure 7: Sketch Of Adaptive Clothing Co Designed Option Of Shalwar Developed With Participant Interviews.

4.03.02 Closures and Placement.

Types of closures and their locations affected how participants donned and doffed garments. For adaptive clothing, participants had indicated that a loose-fitting shirt with a front or side opening was easiest to put on. However, due to the amount of reaching problems to the back and over the head identified in the first phase of the study, the researcher added full front openings at different locations in the proposed adaptive designs, both for functional and aesthetic reasons. Front openings were found in previous studies (Kernaleguen, 1978; Reich & Otten, 1991) to be more satisfactory than those in the back because of the problems in movement of arms and shoulders. Top openings were rejected for similar reasons because the participants would have to pull the garment over their heads. Participants consistently indicated a need to feel ‘covered up’ around the neck and chest for modesty reasons. This finding supports previous research findings about modesty (Behrens, 1963). Once the placement of garment opening and closures was determined in all sketches the types of closures were selected. Participants were asked about their preferences of the types of fasteners that they would like to see on adaptive clothing designs. According to their views buttons could be used if they were large enough for easy manipulation. A diagonal or a keyhole buttonhole was preferred to make the buttons easier to manipulate, and also because the buttons more likely to stay in the hole and these hole were less likely to gap. Snaps and hooks and eyes did not gain a particularly enthusiastic response when presented as alternatives but Velcro was considered very suitable if used properly to serve its function. Zippers received a lukewarm response for functionality.

4.03.03 Neckline.

A round, V, and square neckline that sat low on the neck (i.e., sat level with the hollow at the front of the throat) was preferred by all participants. However, all rejected

high or standing necklines for the adaptive clothing. This was compatible with the needs and preferences expressed in the first phase of study. Collar selections also posed problem. No one needed a collar.

4.03.04 Sleeves.

After consideration of all the sleeve options presented in interviews, sleeves with gusset, kimono and raglan sleeves were considered acceptable sleeve alternatives along with deep set in sleeves. A kimono sleeve is a sleeve cut in one with the waist of the garment (Kopp, Rolfo, Zelin & Gross, 1997). The researcher considered that these gave the wearer a range of motion in the shoulder that was not gained through a regular set in sleeve. The sleeve silhouette was full to the wrist, plain and long. Participants were not interested in having any detail at the wrist, especially buttons, which are difficult to manipulate and uncomfortable when they rested their arms on a flat surface. The sleeves with gusset, kimono and raglan sleeves were presented as an acceptable form of sleeve type for adaptive clothing as understood by the researcher during participant interviews. These were selected by them as both aesthetically pleasing and functionally acceptable types of sleeve designs.

4.03.05 Adaptive Shalwar Features.

For the sake of relieve an adaptation was proposed for the Shalwar keeping in mind the interest of the participants. The adapted design was similar in appearance to regular style but had a belt at top to reduce the bulk of fabric at this area. This adapted design had a full top to bottom double sided zipper opening at each side and at the top a Velcro strap (similar to one applied in the trial adapted shirt) was used to attach front of belt to back of it. From the participant interviews, several options were acceptable about the detailing of the adaptive designs. This section of the study fulfilled objective two of this study.

Description of trial adaptive shirt design				A loose shirt having full opening at both sides with 4 inch long four straps of velcro attached to back of shirt and corresponding loops in front, on both sides as clouser, having raglan sleeves with large button openings till neckline at both sides in front
Measurments of dress for each participant in inches				Design details and sketches of front and back of trial adaptive shirt design
	01	02	03	 
Bust	23	25	26	
Waist	21	23	24	
Hip	25	27	28	
Full Length	39	36	40	
Sleeve Length	21	20	21	
Sleeve Opening	6.5	6.5	7	
Across Back	14.5	14	15.5	
Side Slit	19	17	20	

Figure 8 : Specification Sheet for the Selected Trial Adaptive Shirt Design

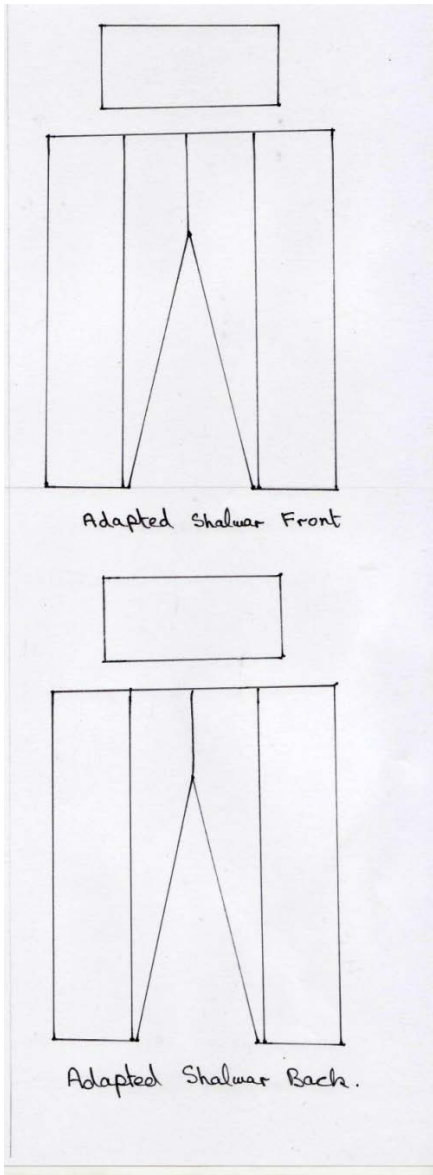
Description of trial adaptive shalwar design				A shalwar with loose belt having elastic waist band and top to bottom opening at both sides with double sided zipper and velcro strapes at both sides of top of back of belt and corresponding loops at both sides of front of belt for clouser
Measurments of dress for each participant in inches				Design details and sketches of front and back of trial adaptive shalwar design
	01	02	03	
Shalwar Length	39	36	40	
Crotch	15	14	16	
Shalwar Width	24	24	24	
Belt Length	7	7	7	
Paincha Width	15	15	16	
Paincha Opening	8.5	8.5	9	

Figure 9 : Specification Sheet for the Trial Adaptive Shalwar Design

4.04 Phase Three : Wear Test and Effectiveness Evaluation

After the construction of co designed options of adaptive clothing from data gathered in interviews with participants the study proceeded to its final phase in which a wear testing was planned. Before wear-testing, one of the adaptive clothing design options of three shirts was selected for construction (see Figure 4), the only design suggested for adaptive Shalwar was also chosen for construction(see Figure 7).This wear trial adaptive garment set became a new instrument to be used in Phase three that is effectiveness evaluation (Research Objective 4). The researcher formulated specification sheets of adapted shirt and shalwar designs to be used to guide the construction and preparation in corresponding sizes (see Figure 8, & Figure 9).

Following the preparation of triplicate sets of trial adaptive garment in three sizes from three prints of same fabric the researcher returned to the original group of participants for wear-testing of three weeks duration. This process provided data for objective three, to assess the effectiveness of trial adaptive garment by interview evaluation. In wear trial, each participant used the triplicate sets of trial adaptive garment at their residence assuming their every day life, then evaluated its effectiveness using Instrument three (see Appendix B5). The effectiveness was dependent upon how the participant had envisioned the finished trial garment after giving information for need assessment phase and afterwards helping the researcher in co designing phase. The participants were to evaluate the trial adaptive garment based on information they had already given in instrument one (see Appendix B2). The rating scale for Instrument three was different from that used in Instrument one. The scale used for wear testing and evaluation was designed for a choice from a scale of 1 to 3 for each clothing dimension. Participants ($n=3$) were asked to rate the trial garment based on their expectations according to the solutions in Instrument one, Section B. If they chose 1, this rating meant

that the trial adaptive garment was “worse than they envisioned” for that area. If they chose 2, it was “just as they envisioned”, and 3 was “better than they envisioned” (i.e., the trial garment exceeded expectations). These ratings were based on previous clothing literature involving wear-tests (Huckabay, 1992; Prevatt, 1991; Rainer-Jeanes, 1994). The results for this section were shown in Table 11 and then qualitative results were reported by each clothing dimension. This section on wear-testing concluded data collection and analysis

Table 11 :

Wear-Testing Results Of Clothing Dimensions For Each Rating Level

		1	2	3
	Clothing Dimension	Worse than I envisioned	Just as I envisioned	Better than I envisioned
1	Uses styles that are easy to don and doff	0	2	1
2	Uses easy to manage fastenings	0	1	2
3	Adds features that allow for movement	0	0	3
4	Ensures coverage in needed areas	0	1	2
5	Provides styling that is comfortable and appropriately sized	0	0	3
6	Ensures quality and durable construction	0	0	3
7	Adapts features specified by user	0	2	1
8	Clothing is designed with more visual appeal	0	0	3

Before specific results were reported, some general comments were stated about the overall participant response about the trial adaptive garment. Several unsolicited comments occurred during the wear-test interviews outside of the framework of the question categories that provided overall evaluation. “I like this garment a lot...I’m very pleased with it. I can see it as a daily wear garment I think that there’s a lot of versatility in it.” (Participant 02). “The minute I put it on I felt very positive about it, I think immediately if you don’t get a good feel you feel bad about it. It gave me a very positive feeling and that helps with the scope of everything that goes into clothing and how you feel in the clothing and how you present yourself in that clothing” (participant 01). All participants felt that adaptations presented in the trial adaptive garment serving as wear-test instrument were sufficient to assess their satisfaction with the trial garment.

4.04.01 Uses Styles That Are Easy To Don & Doff (Dimension 1).

For Dimension 1, no one rated the trial adaptive garment as ‘worse than I envisioned’, two participants(01, & 03) were satisfied with the trial adaptive garment, ‘just as I envisioned’ and one participant (02) thought it exceeded her expectations ‘better than I envisioned.’ Participants felt that the adaptation elements in trial adaptive garment played an important role in their ability to don and doff easily. She said, “it’s pretty easy to put on”, she believed it was easy to put on because the side opening and raglan sleeves allowed plenty of room for the movement necessary to don and doff. The trial adaptive garment met expectations for the entire sample of participants. Large neck and sleeve openings had been suggested by Reich and Otten (1991) as useful solutions to donning and doffing problems for a large sample ($n=787$) of women with arthritis. In addition to confirming their work, this finding suggested that future adaptive styles should be constructed in similar manner to aid in the donning and doffing process.

4.04.02 Uses Easy To Manage Fastenings (Dimension 2).

Participants found that the large button with diagonal buttonhole and Velcro straps were easy to manage. No participant rated this dimension as (1), one participant rated it as (2), while two rated it as (3). The Velcro straps used as fasteners in the side opening were very appreciated by the study participants. This feature allowed them free and comfortable movements while they were in the bed. All participants praised the strap Velcro fastening feature very much as it did not come off by their movements as the old flat Velcro applications used to be. The style of Velcro fastening was cited as very successful by all study patients. Comments on buttons included that the diagonal buttonhole was being better than a regular horizontal or vertical buttonhole because the button did not pull out of the hole, yet was very easy to fasten and unfasten. Comments relating to the diagonal buttonhole were as follows: “I think it’s better than a traditional buttonhole and the size of the button is great” (participant 02), and, “it’s a good size and didn’t hurt my fingers to manipulate it” (participant 01). Previous studies found that changing the shape of the button and/or the buttonhole alleviated some problems with fastenings (Behrens, 1963; Frescura; 1963; Reich & Otten, 1991; Schwab & Sindelar, 1973). The fastenings on the trial garment met and/or exceeded expectations for the entire sample of study.

4.04.03 Adds Features That Allow For Movement (Dimension 3).

All participants ($n=3$) found that the trial garment exceeded expectations for freedom of movement. No participant rated this category (1) or (2). The participants said that the appropriate amount of ease and raglan sleeves made moving easier and the overall roominess of the garment made it very acceptable. Participant (02) responded that it “allows for ease of movement; yes, very happy with that, and it allows complete ease

of movement without (me) looking back and the style is fine, and to bring those two together is especially perfect, so I could give that a three.”

4.04.04 Ensures Coverage In Needed Areas (Dimension 4).

One participant rated this dimension just as they envisioned and two rated it better than they envisioned. Participants considered that the trial garment gave them coverage in needed areas. The longer than regular length made it easier for them to remain covered for modesty when they stand up. One participant (03) liked the aesthetically pleasing proportions. Although the need for extra covering for modesty and warmth was found in previous research (Behrens, 1963), but combining it with features like diagonal buttonholes, complete side opening with Velcro fastening straps, and other design features that were acceptable to participants was unique in this study.

4.04.05 Provides Styling That Is Comfortable And Appropriately Sized (Dimension 5).

All participants found performance of the trial garment in this category met and exceeded expectations. For wear testing, the researcher gave the participants their corresponding sizes based on their body measurements. The participants especially liked the fact that it was appropriately loose fitting, did not appear oversized, and allowed for plenty of movement. “It’s loose enough that I can move completely without binding anywhere and yet it still looks attractive, at least in my opinion” (participant 01). The trial garment was considered “very” comfortable by all participants. No one commented that sizing was inappropriate or that fit was unsatisfactory.

4.04.06 Ensures Quality Durable Construction (Dimension 6).

All participants rated construction quality (3), they equated styling features (e.g., topstitching on the garment, seam construction, fastening application) with quality. They

assumed that highly defined details visible on the outside of the garment represent high quality. The double stitched seams and reinforcement stitching in high stress areas followed Kernaleguen's (1978) suggestions on how to ensure quality and durable construction for the stress exerted areas, and this construction satisfied the participants also.

4.04.07 Adapts Features Specified By participants (Dimension 7).

This dimension was to determine whether or not the trial adaptive garment had incorporated the features deemed necessary by each participant in initial interviews. Two participants considered the trial garment to have incorporated features and rated it (2). One participant considered that the trial garment exceeded expectations in adapting the features originally explained to the researcher and rated it (3). She stated that she liked the style of Velcro fastening straps very much; additionally the buttons, the side seam opening, and the fact that the trial adaptive garment had an appropriate fit resulted in good responses from participants. Participant 03 commented, "it doesn't necessarily jump out and say 'what's wrong with her that she's wearing something like that.'". Wingate, Kaiser and Freeman (1986) had concluded that 'normal' clothing should be developed, which also contains features that are concealed but help to adapt to usage by people with physical disabilities.

4.04.08 Clothing Is Designed With Visual Appeal (Dimension 8).

All participants rated visual appeal as a (3), while they were pleasantly surprised at the amount of visual appeal the trial adaptive garment possessed. They commented that, as the garment was fabricated the way they wanted, they were happy to wear it and considered it to be perfectly acceptable. This concluded all the data collection phases of this study.

Summary: This chapter mainly addressed the complete data analyses at every stage of study. A detailed analysis of the predetermined codes was conducted to reach the findings of the process of research. Multiple methods of instrumentation and analyses were used for this study. Multiple steps were taken in searching for results from data obtained from group of respondents, and multiple types of information were obtained during study. Three proposed research questions guided the development of data analyses of this mix method research project.

Data obtained at each phase was analyzed before beginning the next phase as the results of fundamental stage became the basis of up coming phase. The predetermined codes in form of instrument listings facilitate the process of combining the varied responses. Detailed qualitative analyses of the responses for each code helped to develop salient features of findings at every phase. Due to linear progression of data collection and analyses, a discussion of the results at each stage was also included in the chapter correlating the present findings to the previous researches to mention any similarity or inconsistency. The chapter concluded with detailed analysis of different dimensions of clothing included in the instrument I section B (see Appendix B2) and instrument III (see Appendix B5) to reach to the conclusion about the effectiveness the of efforts made for the development of a trial adaptive clothing for the adult female patients of hemiplegia of grade 0-3 in Pakistan participating in this study.

Chapter 5

Summary, Discussion, Conclusion, and Recommendations

Hemiplegia affects women in many ways and in different degrees. When someone experiences a stroke and is paralyzed the act of getting dressed is a painful ordeal both physically and emotionally. Changes and limitations that occur in physical body are more pronounced for the people with this special need and they have great difficulty finding garments that fit correctly, hang properly and being dressed easily (Meinander & Varheenmaa, 2002). Progress in learning to dress independently is hard to achieve when the clothing one wears is difficult to manipulate and does not fit well. This research about adaptive clothing provided solutions that both the patient and the care giver can have an easier time with dressing. When a segment of society has some specific need, designing clothing to accommodate that need is required (Ali, 2004). Different types of adaptations recommended in this study allow the patient to be dressed with minimal rolling, lifting, or repositioning.

In this chapter significant findings are discussed in light of existing literature. The chapter also encompasses major conclusions drawn from the study, implications of the findings and recommendations for the future research.

5.01 Summary of the Findings

For Objective One, detailed information about physical limitations was gathered during participant interviews demonstrating different physical limitations suffered by the sample of participants ($n=3$). These physical limitations had been itemized based on reports in the literature, the Enabler model (see Figure 2) and assistance from a medical

physical therapy specialist. Analysis of the results showed that body strength, difficulty lifting, reaching or carrying, difficulty handling and fingering, limitations of stamina, limitations of head movement, difficulty with range of motion of body and in coordination were major problem areas for participants. For Clothing Dimensions relating to clothing needs and preferences (Objective One), clothing dimensions were developed from past clothing literature. These findings about clothing dimensions suggest that the researcher's priority in customized designing of some suggestions of adaptive clothing designs for these participants was to find some solutions that generated a comfortable, well-fitting garment that allowed for ample ease of movement with easy to manage fastenings. According to the participants, if this basic style of garment was acceptable, they were willing to use the same basic style. In an analysis of possible connections between physical limitations and clothing dimension problems, connections could be found between the degree of problem with the nine physical limitations and the type of rating given to clothing dimensions and clothing needs and preferences.

For Objective Two, the researcher created three co design sketches for shirts and one for shalwar, these accommodated the features suggested during the participant interviews by each participant to feel comfortable (functional features) and also the aesthetic features that they had indicated they would prefer (symbolic features). The researcher had expected this section of the study to be challenging because of the different nature of each participant's choice, but, in fact, the process of assimilating each participant's needs and preferences into adaptive clothing design options was easier than expected because of the similarity of the body and clothing problem areas.

For objective three to assess the effectiveness of an adaptive design, one adaptive design was selected from those suggested in second stage of the study. Three sets of same adaptive garment in three different prints of same fabric (medium weight cotton)

were made according to the corresponding measurements of individual participants taken during their interviews in phase one. To facilitate the process of construction of the trial adaptive garment sets for the wear test the details of the trial adaptive garment were mentioned on the specification sheets containing the information of style line with flat sketches of front and back, corresponding sets of measurements of dress and detail of construction features.

The triplicate sets of trial adaptive garment made out of same fabric in three different prints were provided to the same group of participants for its evaluation for effectiveness after using these for three weeks. Participants positively evaluated the trial adaptive clothing after using it for recommended period. The participants found some categories as “better than they had envisioned”, these included easy-to-manage fastenings and ease of movement. On the other hand coverage, visual appeal, construction and adaptation of features and style of fastenings were rated as exceeding expectations of the participating group of women.

5.02 Discussion of the Findings

This research study addressed a specialized adaptive clothing development to seek solutions for problem faced by a specific group of individuals, which are adult female patients of hemiplegia of grade 0 to 3 in Pakistan suffering from physical disabilities of similar nature. In order to be perceived acceptable in society and to gain an easier approach to the daily life activities, these individuals wanted to have comfortable and appropriate clothing to wear. Currently little choice exists for them in the traditional clothing designs which enhances their deficiencies and yields an institutionalized or deviated from normal feeling among group.

This study in adaptive clothing development examined the needs of the individuals for developing some clothing solutions to satisfy their needs as expressed by

them in their own cultural context. Within the context of the study, Thoren's (1997) four points of systemic change were addressed. These pertinent points for consideration included increased clothing choice, development of clothing that addressed both symbolic (aesthetic) and functional levels, ease in construction, and communication about available choices. Within the framework of assessing individual needs and applying systemic change in the structure of the basic bodice block, its practical application was also explored to determine if this might be an effective solution suitable of obtaining optimum satisfaction for individuals. The results are in cognizance with the view of several researchers (Behrens, 1963; Brandt, 1993; Caldwell, 1999; Clevenger, 1999; Creekmore 1963; Freeman, Kaiser, & Wingate, 1986; Garg & Owen, 1992; Giddings, 1999; Huckabay, 1992; Jette, 1994; Kidd, 2006; Kottke, 1982; Na, 2007; Rainer-Jeanes, 1994; Reich & Shannon, Handicap, 1980; Wojciechowski, 2003)

Due to the multiple methods used in this study, care was taken to ensure that the methods of obtaining results were valid. In Phase one of the study, interviews were used to collect data from participants. According to Miller (1991), interviews are advantageous for gathering data in many ways, including that (a) interview responses are likely to be correct, (b) interviews yield a high rate of return, (c) supplementary information about the respondent's environment can be assessed, (d) visual materials can be presented, and (e) the interviewer can usually control which person answers the questions (within a multi-subject interview). Qualitative interviewing is a way of gathering in-depth information about a phenomenon (Rubin & Rubin, 1995).

During the qualitative interview process, keywords were taken in note form. This note-taking actually starts the data analysis process simultaneously with data collection (Creswell, 1984). Interviewing is expected to be an effective method of identifying personal limitations and clothing problems within the context of this study. Other

methods might not obtain the depth of information necessary to ascertain real needs and preferences. Information from interviews was used to design a trial adaptive garment that was truly user oriented, as recommended by many researchers of design theory and practice (e.g., DeJonge, 1984; Lamb & Kallal, 1992; Boettke, 1957; Clevenger, 1999; Freeman, Kaiser, & Wingate, 1986; Kottke, 1982). Wear testing has been recommended by previous research and has been put into practice with many small groups similar to the one proposed in this study (e.g., Friend et al., 1973; Moran, 1976; Phipps, 1977; Warden & Dedmon, 1975; White & Dallas, 1977; Ali, 2004; Dell Orto & Marinelli, 1995). Wear testing has been used in many clothing studies as a final component of new product development (Koberg & Bagnall, 1981; Lamb & Kallal, 1992; Watkins, 1984). Wear testing of a product is done in industry by testing a garment on a fit model for consistency of fit (Frings, 1991; Diamond & Diamond, 1997). In this study, more factors were involved than fit therefore more criteria needed to be assessed. Wear testing was not easy in terms of measuring the reality of the situation when testing for garment performance. Validity of wear testing was increased by giving explicit instructions. There is evidence of low correlation between simulated 'lab' tests and long-term studies (Collier & Epps, 1999); however, due to time and financial constraints, the wear testing in this study was conducted in a short time frame, not over a longer period of time. The researcher recognized the 'unreal' situation of the wear tests. The focus of this study at this stage was more on the effectiveness of the trial adaptive garment rather than long term clothing product performance; therefore, a short wear test was considered sufficient to evaluate participant satisfaction. Precedent exists for both wear testing and an evaluation questionnaire in assessment of functional clothing (Bergen, Capjack, McConnan & Richards, 1996). For accuracy of assessment, the evaluation questions related directly to the clothing dimensions outlined in participant interviews.

In qualitative research, reliability (that is, whether two researchers using the same methods will come up with similar results) is generally assessed by transparency, consistency, coherence, and communicability of the study (Rubin & Rubin, 1995; Babbie, 1992; Creswell, 1994; Jette, 1994). Researcher has tried to maintain transparency of the processes of data collection by clearly stating all the steps taken to ensure that measurements of specific concepts were the most precise according to the constraints of the researcher.

To maintain transparency, transcripts were made of all data collection processes and audiotapes made of participant interviews, and wear test evaluations. Patton (1990) recommends tape recording and taking short notes during the interview process to prevent important information from being neglected, to keep up the pace of the interview and to avoid recall problems. Audiotapes were also useful to ensure accuracy in data analysis. Audiotapes are recommended for reliability by Endo (2000). Expert in the clothing design field checked the sketches of proposed and co designed adaptive clothing solutions and specification sheets were made to maintain transparency in the construction of the trial adaptive garment.

Wear testing with the participants took place using audiotapes as back-up to researcher notes. These audiotapes were replayed to check participant comments against the researcher's notes during transcription of the evaluation sessions. During data collection in wear tests, the researcher asked for comments by participants in reaction to the clothing according to specific categories on the instrument. Other comments or suggestions were noted separately. Instruments for interviews and wear-test evaluations were pilot-tested. To render the time frame reliable for the study, all research was conducted in as short a time as possible, to avoid change through maturation in the situation of the participants and in technology.

The researcher has performed qualitative work before this study. The researcher's Masters research was also qualitative in nature, about design variation possibilities by dart manipulation, in the field of structural designing of cloths. The researcher is skilled in apparel design techniques; completing classes in the Bachelors, Masters, and MPhil program in clothing design and construction. These previous professional expertise contributed to the completion of this study. Some previous personal onsite semi structured interviews were also carried out during the course of MPhil degree. In addition, formal classes have been taken in the researcher's Masters and MPhil course of study in qualitative research methods.

5.03 Implications of the Findings

The purpose of this study was to explore the possibilities of making suitable clothing for adult female patients of hemiplegia of grade 0 to 3 in Pakistan. The objectives were to obtain information about clothing needs and preferences from a group of women, use this information to co-design and create structural modifications in clothing that suit the unique needs in local context of modesty and style, finally to evaluate the women's satisfaction with a wear test of trial garment, and suggest further research strategies. Findings of the current study are important because these have several implications.

There are a number of hemiplegia adult female patients suffering from severe physical limitations in Pakistan having specific clothing needs; hence the development of adaptive clothing for this population was strongly felt. Pakistan has its own unique dress styles and standards of modesty for women. No study had been done to provide solutions for such special needs in local context. Such women become able to obtain the quality of life, maintain the dignity, and make the tasks of dressing and undressing easier by the recommended convenient and comfortable solutions of adaptive clothing designs.

The ethics dictated that the needs of such people should be realized in order to provide opportunities of a better life for them and efforts were required to explore possibilities to make their daily life as comfortable as possible. This study was a contribution of the expertise of researcher to present ideas and solutions to address these special needs of clothing. Better appearance through improvement of clothing helped such people to believe that they had worth in the sight of others and in their own view. Such patients made the access to the world a little easier by provision of adaptive clothing designs.

The feeling of self-confidence, the sense of well-being and of social acceptance came from the wearing of clothing which was functional, appropriate and attractive. This was important to all people but to those with special needs it was much more important. Adaptive clothing options provided an immense socio-psychological boost among such women. Until recent years little research had been shown in developing adaptive clothing for various types of physical limitations. Earliest efforts to develop more practical clothing for individuals with special needs were pioneered by occupational therapists that had daily contact with such people and their dressing problems. The pressing need for clothing that such people can manage was emphasized by Boettke (1997) in a study conducted to determine how much help is considered necessary by the patients in activities of daily living. Dressing posed a problem for hemiplegia patients because of poor muscular coordination or extraneous movement and conditions worsen when the selection of appropriate clothing was none or very limited by what was available.

Until recently little interest was shown by manufacturers in the design and construction of clothing for the person for whom dressing was a problem. Till today most of the clothing for the people with physical limitations and resulting special needs were only specially custom designed and ordered. Women surviving from hemiplegia, no less

than the rest of us, desired good design in the clothes they wear. The selection of clothing was largely an individual problem, based on particular needs and preferences. As a group of people having the same general physical limitation, their needs and preferences were similar thus same designs were a solution for all. These needs were not met by traditional clothing designs. The outcome of the study was equally useful for anyone with limited mobility, ones who needed care due to problems of weight bearing or limitation of dexterity and to accommodate challenges of severe arthritis, frozen shoulder, Alzheimer's disease or extreme weakness due to any other reason.

The out come of study also provide a base line for starting an entirely new product line for niche marketing to women suffering from physical limitations due to hemiplegia in the Pakistan.

5.04 Conclusions

Research Question 1: What different areas of dress require adaptations for adult female patients of hemiplegia of grade 0 to 3 in Pakistan?

Specific physical limitations that were common to this group ($n=3$) of adult female patients of hemiplegia of grade 0 to 3 in Pakistan were grouped into following categories, (a) range of motion, (b) motor planning, (c) strength, (d), sensory, (e) stamina, and (f) other. All categories impacted both the wearing of clothing and styling of clothing. The clinical definition of a disease appeared to be consistent to the identification of physical limitation categories. This finding supported previous clothing research by Yep (1977), Reich and Shannon (1980), and Newton (1984-85) who arrived at similar conclusions with different categories of physical limitations. Physical limitations impacted the ability of such women to find suitable clothing in a number of ways. According to the clothing dimensions used in Instrument I Section B (see

Appendix B2), significant problem areas for the participants were in finding clothing that did not constrict them and finding clothing that had easy to manage fastenings. The problems with constricting styles were solved with designing garments that had plenty of room built into them for ease of movement. New generations of fastenings need to be modified in the manner of application that was more user-friendly. All categories of physical limitations impacted selection and use of adaptive clothing. All participants wanted to find clothing that was easy to move in, easy to don, doff and fasten, and which maintained a suitable appearance. As one participant stated, “women with physical disabilities want clothing that does not set them apart from other women.”

Research Question 2: What adaptations of clothing can be designed for adult female patients of hemiplegia of grade 0 to 3 in Pakistan?

Using a co design technique, the researcher established common clothing features preferred among participants, which were put into a trial adaptive clothing solution. These included a loose, unfitted shape; no defined waistline area; a front or side opening, diagonal buttonholes and large sized buttons; a simple basic neckline with no collar; raglan, deep set in, and sleeve with gusset. With the accepted linkage between disability and limitations, these features were also applicable for adaptive clothing for populations with a range of physical disabilities in future applications.

Research Question 3: How effective the proposed adaptive clothing is for adult female patients of hemiplegia of grade 0 to 3 in Pakistan?

All the selected features were incorporated into an adaptive clothing solution produced as a trial adaptive garment in this study as a result of co designing with participants. Wear test evaluations by original participants had demonstrated that appeal and functionality could be maintained. Ratings of the trial adaptive garment set in all

clothing dimensions were generally good. The participating women in the evaluation stage found the provided trial garment was just as they envisioned or better than they envisioned for a garment that they would wear.

5.05 Recommendations

When a study is made with a small sample, such as this one, the first recommendation is that the study be repeated with a larger sample and for a longer period of time. After careful analysis of the methods and procedures used for current study some recommendations for refinement of the study are suggested. In addition to replication of the study, recommendations for refinement or for further study are made. Some recommendations explain ways that future studies could validate and extend the present study and other recommendations describe new ideas that could be explored to further expand the research applications and literature base.

5.05.01 Perspectives for Future Research.

1. The number of individuals comprising the participant sample of adult female patients of hemiplegia of grade 0 to 3 can be increased in number and in range of severity of the attack of hemiplegia.

2. The identification of common problems of clothing dimensions indicate the potential for a more focused and quantitative method of data collection to be used with the larger participant sample. One example of this can be the use of a survey questionnaire with a large sample, which could be analyzed to determine statistical significance using regression techniques or analysis of variance (ANOVA). An experimental research design might consist of a stamina and endurance study of donning and doffing clothing, which varies with disease, activity, environment, and time.

3. Wear testing can take place among two groups, the original participants of study and other group comprising of women with out any physical disability. This will allow comparison of views between participants of study and views of people with out physical disability

4. The issue of comfort in type of fabric used for clothing can be addressed in future researches. Future studies can develop focus on fabrication issues by including use of different fabrics in such study.

5. The researcher and original group of participants can be removed from the wear testing component of the study because of the potential for bias. The participants have worked with the researcher in developing the adaptive clothing design and may not give an objective viewpoint about the finished trial garment.

6. Future studies attempting to replicate this one can make an attempt to bring this idea for ready to made products.

7. Some researches can be conducted with a larger sample size of participants and a cross-section analysis of other features like demographics to analyzed and determine statistical significance of these different features contributing to specialized adaptive clothing design development.

This study has linked women with physical disabilities to a normal life with help of using adaptive clothing, a unique design concept.

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Appendixes

Appendix A - Consent Form

Informed Consent for Participants in Research Project

Title of Project_____Adaptive Clothing for Hemiplegia Patients

Researcher . Asna Mubashra

I. Purpose of this Research/Project

The purpose of this project is to determine whether appropriate adaptive clothing for women surviving from hemiplegia with physical disabilities can be designed. The anticipated contributions of the findings are to further expand the literature on clothing for individuals with physical disabilities and to move towards a practical solution to the problem of adaptive clothing accessibility for people with physical disabilities. The subject pool will consist of three Pakistani adult female patients of hemiplegia of grade 0 to 3. Specific location and single gender selection is being used here because of specific dressing style of this region and existing cultural differences between men's and women's clothing. The same subject pool will also participate in wear testing the trial adaptive garment in order to help evaluate the effectiveness of design.

II. Procedures

The procedures involving the human subjects are in two stages. Stage One involves semi structured interviews with these women by the researcher. In these interviews, the women will be asked to identify clothing problems that they experience due to their physical limitations and will co-design an adaptive garment by sketching with the researcher their 'ideal' type of clothing. Stage Two involves a wear-test for evaluation of effectiveness of trial adaptive garment. During this evaluation, women will use the trial adaptive garment for a period of three weeks to evaluate its effectiveness. Questions will be asked pertaining to various clothing dimensions (e.g., comfort, fit, style features).

In Stage One, the interview interactions will last one hour and will be conducted by the researcher, at the residence of each participant. The participant will be expected to answer specific questions related to the clothing issues. Body measurements of chest, waist, hips and back length will also be taken at this stage. The wear-testing interaction (Stage Two) will last one hour and will be conducted by the researcher at residence of each participant. The subjects will be expected to only put on, wear and take off the given three sets of same trial adaptive garment for three weeks and answer questions related to its ease of use.

III. Risks

This study presents no risks to the participants.

IV. Benefits

Benefits to the sample of women in the study focus on creation of appropriate adaptive clothing in local context that will help this population. No promise or guarantee of benefits has been made to encourage participation in this project. Subjects may contact the researcher at a later time for a summary of the research results.

V. Extent of Anonymity and Confidentiality

Each subject will be given a code number (01, 02, & 03) to identify individuals during interview note taking, transcriptions, audio taping and reports. At no time will names be recorded for use in the study. Transcripts will be made from field notes and audiotapes recorded during in-person interviews, wear-testing interviews, by the researcher. The code number of the recorded participant will identify these tapes. The codebook will be kept in a secure place. Only the researcher and advisor will have access to the codebook, the tapes and the transcripts. The codebook, tapes and transcripts will be destroyed after three years. The researcher will be performing the transcriptions from

the audiotapes. At no time will the researchers release the results of the study to anyone without the subject's written consent.

VI. Compensation

Each participant will be given the three sets of trial adaptive garment which will be used by them in the last phase of the study.

VII. Freedom to Withdraw

Participants are free to withdraw from a study at any time without penalty. Participants are free not to answer any questions or respond to situations that they choose without penalty. There may be circumstances under which the investigator may determine that a participant should not continue as a subject.

VIII. Approval of Research

This research project has been approved, as required, by the Board of Studies of the University of Punjab, Pakistan

12 July 2010

18 March 2011

Approval Date

Expiration Date

IX. Participant's Responsibilities

I voluntarily agree to participate in this study. I have the following responsibilities:

- Participate in a face-to-face interview.
- Have body measurements taken from four areas of the body.
- Put on and take off an adaptive garment for three weeks.
- Answer questions relating to that trial garment.

X. Participant's Permission

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

_____Date_____

Subject signature

Should I have any questions about this research or its conduct, I may contact:

Mrs. Asna Mubashra.

MPhil Scholar

College Of Home Economics

University of Punjab

Lahore.

Participants must be given a complete copy (or duplicate original) of the signed Informed Consent.

Appendix B - Instruments

Appendix B1

Instrument I – Section A

Body limitations (Null, & Cherry, 1997).

		Ranking	Comments
		0 No Problem	
Areas of Physical Limitations		1 Potential Problem	
		2 Occasional Problem	
		3 Problem	
		4 Impossibility	
1	In coordination	0 – 1 – 2 – 3 - 4	
2	Limitations in Body Movements	0 – 1 – 2 – 3 - 4	
3	Limitations of Head Movements	0 – 1 – 2 – 3 - 4	
4	Limitations of Stamina	0 – 1 – 2 – 3 - 4	
5	Limitations of Sensations	0 – 1 – 2 – 3 - 4	
6	Difficulty Lifting, Reaching, or Carrying	0 – 1 – 2 – 3 - 4	
7	Difficulty Handling and Fingering	0 – 1 – 2 – 3 - 4	
8	Inability to Use Extremities	0 – 1 – 2 – 3 - 4	
9	Difficulty in Range of Motion of Body	0 – 1 – 2 – 3 - 4	
10	Others	0 – 1 – 2 – 3 - 4	

Explanation Of Enabler Categories of Body Limitations

(Null, & Cherry, 1997)

A In coordination

Limited control in placing or directing extremities.

B Limitations in body strength

Strength in body is limited in terms of force exerted and/or duration of force exerted.

C Limitations of head movement:

Difficulty looking up, down, or to the side. In severe cases, field of vision and extremity movement may be effectively limited.

D Limitations of stamina:

Fatigue, shortness of breath, or abnormally elevated blood pressure from even very mild exertion.

E Limitations of sensation:

Impaired ability to detect heat, pain or pressure.

F Difficulty in lifting, reaching or carrying:

Impaired mobility, range of motion, or strength of extremities.

G Difficulty in handling or fingering:

Impaired hand or finger mobility, range of motion, or strength.

H Inability to use extremities:

Severe in coordination, complete paralysis, of extremities

I Difficulty with range of motion of body

Limitations exist in part or all of body in terms of variation from 'normal' range of movement.

Appendix B2

Instrument I – Section B

Potential Clothing Problems and Body Measurements

		Ranking	Comment
		0 No Problem	
		1 Potential Problem	
		2 Occasional Problem	
		3 Problem	
		4 Impossibility	
Clothing Dimensions			
1	Difficulty donning and doffing clothing	0 – 1 – 2 – 3 - 4	
2	Difficulty managing fasteners	0 – 1 – 2 – 3 - 4	
3	Lack of freedom of movement	0 – 1 – 2 – 3 - 4	
4	Inappropriate and uncomfortable fabric	0 – 1 – 2 – 3 - 4	
5	Inadequate coverage of body	0 – 1 – 2 – 3 - 4	
6	Style can be constricting and uncomfortable	0 – 1 – 2 – 3 - 4	
7	Construction quality inadequate for exertion of stress	0 – 1 – 2 – 3 - 4	
8	Some features are irritating	0 – 1 – 2 – 3 - 4	
9	Not all clothing is aesthetically pleasing	0 – 1 – 2 – 3 - 4	

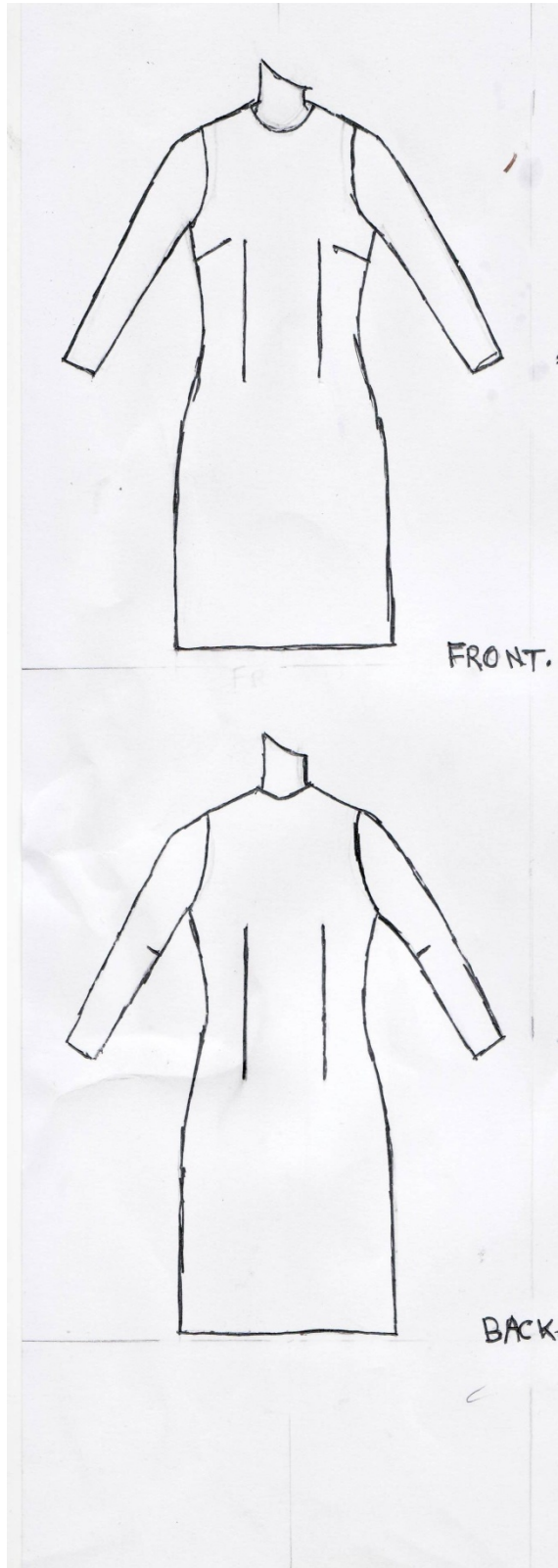
Body Measurements

Participants	Bust		Waist		Hip	
	Inches	Cm	Inches	Cm	Inches	Cm
01						
02						
03						

Appendix B3

Instrument II – Section A

Sketch Development from Basic Bodice Block



Appendix B4

Instrument II – Section B

Sample specification sheet for shirt

Description of trial adaptive design				
Measurments of dress in inches				Design details and sketches of front and back of trial adaptive shirt design
	01	02	03	
Bust				
Waist				
Hip				
Full Length				
Sleeve Length				
Sleeve Opening				
Across back				
Slits				

Instrument II – Section B

Sample specification sheet for shalwar

Description of trial adaptive design				
Measurments of dress in inches				Design details and sketches of front and back of trial adaptive shalwar design
	01	02	03	
Belt				
Waist				
Hip				
Belt Length				
Paincha Width				
Paincha Opening				
Shalwar Length				
Crotch				

Appendix B5

Instrument III

Evaluation of Trial Garment

		Ranking	
		1 Worse than I envisioned	
Clothing Dimensions		2 Just as I envisioned	Comment
		3 Better than I envisioned	
1	Uses styles that are easy to don and doff	1 – 2 – 3	
2	Uses easy to manage fasteners	1 – 2 – 3	
3	Adds features that allow for movement	1 – 2 – 3	
5	Ensures coverage in needed areas	1 – 2 – 3	
6	Provides styling that is comfortable and appropriately sized	1 – 2 – 3	
7	Ensures quality and durable construction	1 – 2 – 3	
8	Adapts features specified by participant	1 – 2 – 3	
9	Clothing is designed with more visual appeal	1 – 2 – 3	