

Clothing Fasteners:  
Ease of Manipulation and Preference  
Among Arthritic Women

by

Valerie Lynne Forcese

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## ABSTRACT

The activities of daily living place many stressful demands on the hand and finger joints. Power and precision, both singly and in combination, are required to perform all hand related activities - especially those tasks associated with self-care, as in dressing. The ability to manipulate clothing fasteners is one of those tasks which is dependent upon the functional capabilities of the hand in terms of strength, dexterity, and co-ordination. Those persons with a hand dysfunction are at a disadvantage in this respect in that they possess limited functional ability.

This study focuses on women with an arthritic hand dysfunction in an attempt to determine which fasteners they prefer to use, when both functional and aesthetic considerations are taken into account. The purpose of this study was to assess the functional hand ability of fifty arthritic women in terms of their manipulative ability of four different types of clothing fasteners (buttons, zipper, Velcro, and snaps); to ascertain their perceived difficulty of managing these fasteners; to determine their preferred appearance ranking of the fasteners; and to determine their preferred usage of these clothing fasteners in front closure styled garments.

An in-home interview and an evaluation of the subject's manipulative ability were performed first, followed by an assessment of the subject's hand ability in terms of strength, dexterity, and co-ordination. To

evaluate manipulative ability, each subject was asked to manipulate four different types of clothing fasteners, each of which were sewn to four separate, adjustable testing vests. The interview included questions designed to determine the subject's perceived difficulty of managing the fasteners; her preferred ranking of each fastener in terms of attractiveness; and her acceptance of the fasteners in various front closure styled garments. To determine hand ability, two testing procedures were undertaken; a nine-hole peg test was used to determine dexterity and co-ordination for each hand, and a sphygmomanometer was adapted to determine manual grip strength.

The results obtained indicated that the fifty arthritic women tested had low levels of grip strength and that the majority of the women had poor dexterity levels in comparison to the norm. Their responses also revealed the importance of conventional appearances in fasteners when used in garments; for example, although buttons were perceived as being the hardest to handle in terms of manipulation, they were considered to be the most preferred fastener in terms of attractiveness as well as being the most preferred fastener for use in front closure styled garments. It was found that the Velcro and the zipper fasteners were rated as viable alternatives to buttons in front closure style garments. The snaps were perceived as being the least attractive of all the fasteners, and also as being difficult to manipulate. Of all the fasteners, the snaps were the least favoured clothing fastener in front closure styled garments. The information gathered in the course of this study also suggested several design features which could be incorporated into garments to provide for the functional and psychological needs of arthritic women.

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## TABLE OF CONTENTS

|  |             |
|--|-------------|
| ABSTRACT . . . . .                               | ii          |
| ACKNOWLEDGEMENTS . . . . .                       | iv          |
| <u>Chapter</u>                                   | <u>page</u> |
| I. INTRODUCTION . . . . .                        | 1           |
| Statement of the Problem . . . . .               | 4           |
| Objectives . . . . .                             | 5           |
| Hypotheses . . . . .                             | 6           |
| Definition of Terms . . . . .                    | 7           |
| Clothing Fastener(s) . . . . .                   | 7           |
| Hand Ability . . . . .                           | 7           |
| Manipulative Ability . . . . .                   | 7           |
| Preference . . . . .                             | 7           |
| Rheumatic Diseases . . . . .                     | 8           |
| Assumptions . . . . .                            | 9           |
| Limitations . . . . .                            | 9           |
| Delimitations . . . . .                          | 10          |
| II. REVIEW OF LITERATURE . . . . .               | 11          |
| Clothing Needs . . . . .                         | 15          |
| Physical Needs . . . . .                         | 17          |
| Psychological Needs . . . . .                    | 21          |
| Social Needs . . . . .                           | 24          |
| Clothing Designs for the Handicapped . . . . .   | 25          |
| Implications for Dressing . . . . .              | 26          |
| Garment Selection . . . . .                      | 27          |
| Garment Attractiveness . . . . .                 | 30          |
| Self-help Clothing Features . . . . .            | 30          |
| III. METHODOLOGY . . . . .                       | 36          |
| Sample Selection . . . . .                       | 36          |
| Description of the Sample . . . . .              | 38          |
| Development of the Testing Instruments . . . . . | 38          |
| Testing Vests . . . . .                          | 38          |
| Peg Board Test . . . . .                         | 41          |
| Grip Strength Test . . . . .                     | 41          |
| Recording/Interview Sheets . . . . .             | 42          |
| Pre-Test . . . . .                               | 43          |
| Testing Procedure . . . . .                      | 43          |
| Hypotheses Testing . . . . .                     | 47          |

|     |   |             |
|-----|---|-------------|
| IV. | RESULTS AND DISCUSSION . . . . .                            | 49          |
|     | Sample Description . . . . .                                | 49          |
|     | Data Analysis . . . . .                                     | 51          |
|     | Lambda (Guttman's Coefficient of Predictability) . . . . .  | 51          |
|     | Hand Ability . . . . .                                      | 52          |
|     | Manipulative Ability . . . . .                              | 55          |
|     | Preference . . . . .  | 60          |
|     | Hypothesis 1. (stated in the null form) . . . . .           | 66          |
|     | Crosstabulations: . . . . .                                 | 66          |
|     | Hypothesis 2. (stated in the null form) . . . . .           | 70          |
|     | Crosstabulations: . . . . .                                 | 70          |
|     | Hypothesis 3. (stated in the null form) . . . . .           | 74          |
|     | Crosstabulations: . . . . .                                 | 74          |
|     | Hypothesis 4. and 5. (stated in the null form) . . . . .    | 76          |
|     | Crosstabulations: . . . . .                                 | 76          |
|     | Fastener Acceptability - "Yes" Responses . . . . .          | 77          |
|     | Fastener Acceptability - "Maybe" Responses . . . . .        | 79          |
|     | Fastener Acceptability - "No" Responses . . . . .           | 79          |
| V.  | CONCLUDING REMARKS . . . . .                                | 83          |
|     | General Conclusions . . . . .                               | 83          |
|     | Summary of Findings . . . . .                               | 85          |
|     | CITED REFERENCES . . . . .                                  | 91          |
|     | <u>Appendix</u> . . . . .                                   | <u>page</u> |
| A.  | SELF-HELP CLOTHING PUBLICATIONS . . . . .                   | 95          |
|     | EXAMPLES OF PUBLISHED WORKS (U.S.) . . . . .                | 96          |
|     | EXAMPLES OF PUBLISHED WORKS (LONDON, ENGLAND) . . . . .     | 97          |
| B.  | CLOTHING ENTITIES ACCORDING TO DRESSING DIRECTION . . . . . | 98          |
| C.  | GARMENT STYLE SELECTION . . . . .                           | 103         |
| D.  | RECOMMENDED CLOTHING FASTENERS . . . . .                    | 111         |
| E.  | VEST DESIGN . . . . .                                       | 115         |
| F.  | TESTING VEST DETAILS . . . . .                              | 120         |
| G.  | TESTING VEST PROCEDURE . . . . .                            | 125         |
| H.  | HAND ABILITY TESTS . . . . .                                | 129         |

|    |   |     |
|----|---|-----|
| I. | RECORDING/INTERVIEW SHEETS . . . . .      | 134 |
| J. | CONSENT FORM . . . . .                    | 138 |
| K. | HAND DEXTERITY PERCENTILE CHART . . . . . | 140 |
| L. | CROSSTABULATION TABLES . . . . .          | 143 |

## LIST OF TABLES

| <u>Table</u>   | <u>page</u> |
|--|-------------|
| 1. Degree of visual deformity of 50 arthritic women . . . . .        | 50          |
| 2. Length in years of having arthritis of 50 arthritic women . . .   | 50          |
| 3. Types of arthritis of 50 arthritic women . . . . .                | 50          |
| 4. Average grip strengths of 49 arthritic women . . . . .            | 53          |
| 5. Hand dexterity scores based on percentile norms . . . . .         | 54          |
| 6. Perceived Rankings in terms of handling ease . . . . .            | 56          |
| 7. Perceived Handling Ease . . . . .                                 | 57          |
| 8. Level of Completion during fastener closing . . . . .             | 58          |
| 9. Alignment difficulty in closing the fasteners . . . . .           | 59          |
| 10. Perceived rankings in terms of attractiveness . . . . .          | 60          |
| 11. Perceived Attractiveness . . . . .                               | 62          |
| 12. Perceived acceptability of clothing fasteners in a blouse . . .  | 63          |
| 13. Perceived acceptability of clothing fasteners in a vest . . . .  | 63          |
| 14. Perceived acceptability of clothing fasteners in a jacket . . .  | 64          |
| 15. Perceived acceptability of clothing fasteners in dress . . . . . | 65          |
| 16. Perceived acceptability of clothing fasteners in a coat . . . .  | 66          |
| 17. Average grip strength (GS) by Handling ease (HE) . . . . .       | 67          |
| 18. Handling Ease (HE) by Attractiveness (AT) . . . . .              | 71          |
| 19. Handling Ease (HE) by Acceptability in Garments (AC) . . . . .   | 73          |
| 20. Attractiveness (AT) by Acceptability in Garments (AC) . . . . .  | 75          |
| 21. Handling Ease (HE) by Attractiveness (AT) . . . . .              | 78          |
| 22. Handling Ease (HE) by Attractiveness (AT) . . . . .              | 80          |

## Chapter I

### INTRODUCTION

One of the most basic activities of daily living is dressing. As an isolated activity, dressing is a complex one, involving not only co-ordination and dexterity but also balance and a full range of motion in both upper and lower limbs. However, it would seem to be part of the process of growing up that able bodied persons quickly lose sight of the physical and mental abilities needed to clothe oneself. Perhaps the development of this casual attitude can be attributed to a general lack of awareness and understanding of the complex nature of the human body.

On the other hand, this type of attitude is much less apparent among those who are less capable of dressing independently. Physical limitations complicate self-dressing, which inevitably leads not only to fatigue, but also to frustration. Those who for the most part of their lives have had no history of dressing difficulty may find it particularly frustrating to be faced with the prospect of having to change their dressing habits when they become physically disabled. Their elevated self-awareness in terms of ability may produce a greater determination on their part to compensate for any increase in the time and energy it takes to dress. This may be evident in some as a genuine reluctance to give up fashionable or 'conventional' appearance just for the sake of employing design modifications for easier dressing.

Part of the problem is that clothing designers tend to design garments based on the 'standardized' human body. Little emphasis is placed on designing for the 'less perfect' human form. It would appear that in this respect the clothing industry is very inflexible in its approach to garment design, in that they tend to orient their styles towards mass production techniques. This is not due to a lack of ability; for instance, sportswear represents a clear example of how designers are capable of incorporating function into garment designs to promote maximum movement and comfort without sacrificing a fashionable appearance. Again, however, their design ability is mainly directed towards the 'idealized' end of the human spectrum. Because of this situation, the designing of garments is not always totally anthropometric in philosophy.

The human body capable of only limited motion tends to be ignored when garments are designed for every day wear. In the past, designers have dealt with problems of limited motion through a trial and error process. Today, this method is still commonly used in designing garments for the special needs of the handicapped.

Two approaches exist in attempting to deal with this situation; the first would be to direct design at individual needs caused by disease or injury, and the second would look at common disabilities regardless of the cause of the impairment or restriction. Thus through the latter approach, designs for the handicapped could be geared primarily at the common 'effect' of the disease or injury, rather than at their specific 'cause'.

Therefore, from the designer's point of view, a person's functional ability is more important as a factor in designing for special needs

than the actual impairment itself. In order to design garments effectively for the handicapped, their limited movement, strength, balance, and agility must be considered.

Hand dysfunction, for example, may result from many types of diseases or injuries. This limited functional ability in the hands can adversely affect one's dressing ability. Therefore, clothing designs must be sensitive to the needs of the disabled who experience some form of hand dysfunction. It is the responsibility of clothing designers to use their abilities in order to improve garment designs and to promote the use of manageable clothing fasteners, with the former being an overall design problem, and the latter being an internal design problem. These design considerations would be beneficial to those persons who for various reasons experience some form of dressing difficulty.

Regardless of style, clothing fasteners are an integral component in the mechanism of opening and closing a garment. Fasteners therefore serve a definite function and also contribute to the aesthetic appeal of the overall design of a garment. To manipulate clothing fasteners, varying degrees of strength, co-ordination, and dexterity are required. Any decrease in functional hand ability can greatly affect one's capability of manipulating different types of clothing fasteners. Ideally, one could eliminate all fasteners in garments, thus removing the problem; unfortunately, fashion as reflected in garment styles dictates otherwise. Therefore, it is the general intent of this thesis to compare the relationship of functional hand ability with the ability to manipulate various clothing fasteners.

### 1.1 STATEMENT OF THE PROBLEM

In activities of daily living many stressful demands are placed on the hand and finger joints. Power and precision, both singly and in combination, are required to perform all hand related activities - especially those tasks associated with self-care, as in dressing. The ability to manipulate clothing fasteners is one of those tasks which is dependent upon the functional capabilities of the hand in terms of strength, dexterity, and co-ordination. Those persons with a hand dysfunction are at a disadvantage in this respect in that they possess limited functional ability.

This study will attempt to determine whether persons with an arthritic hand dysfunction have any preferences among various kinds of clothing fasteners, and if it exists, whether this preference is determined by their physical limitations (in terms of their ability to manipulate these fasteners), or by their perception of them in terms of 'acceptable' appearance. In other words, is their preference in clothing fasteners more a result of their hand dysfunction, or of their desire to present a 'normal' fashionable appearance? This is an important question for clothing designers. If the preferences of those people with various forms of hand dysfunctions can be shown to be consistent, the problem can be approached as one of design for a group; if they are not, custom design for the specific effects of each individual's hand impairment must be undertaken instead.

It is the intent of this study to assess the functional hand ability of a selected group of adults who experience some form of hand dysfunction related to a specific disease. It was found in the course of pre-

liminary research that arthritis was a significant cause of hand dysfunction among the adult population and that women were more likely to be affected than men. Therefore, the purpose of this study will be to assess the functional ability of arthritic women in relation to their manipulative ability of different types of clothing fasteners; to ascertain their perceived difficulty of managing these fasteners; to determine their preferred appearance ranking of the fasteners; and to ascertain their preferred usage of the clothing fasteners in front closure styled garments.

## 1.2 OBJECTIVES

The general purpose of this study was to determine whether arthritic women with a hand dysfunction have any preference among various types of clothing fasteners, and to what extent their preference is determined by their limitations in terms of ability to manipulate these fasteners or by their perception of them in terms of fashionable appearance. Thus, the major objectives of this study are:

1. to assess the functional hand ability of arthritic women in terms of grip strength and hand dexterity;
2. to determine their manipulative ability of four different types of clothing fasteners;
3. to ascertain their perceived difficulty of managing these fasteners in a standardized test garment;
4. to determine their preferred ranking of these fasteners in terms of attractiveness.

Since the results of this research will also be informative in nature, the following objectives were formulated in order to translate the data obtained into a form which will be useful to both health agencies and the arthritic:

5. to determine their acceptance of the clothing fasteners used in various front closure garments;
6. to develop recommendations for fastener use in garments for arthritic women.

### 1.3 HYPOTHESES

The following hypotheses are stated in the null form in order that they may be accepted or rejected in this study:

1. There is no relationship between hand dysfunction (as determined by grip strength and hand dexterity) and the ability of the arthritic women to manipulate the four different types of clothing fasteners.
2. There is no relationship between their preference ranking for these fasteners and their ability to manipulate them.
3. There is no relationship between their preference ranking for these fasteners and their perceived acceptability of the fasteners when used in front closure style garments.
4. The perceived acceptability of each clothing fastener when used in front closure style garments is not related to fastener handling ease.
5. The perceived acceptability of each clothing fastener when used in front closure style garments is not related to fastener attractiveness.

#### 1.4 DEFINITION OF TERMS

##### 1.4.1 Clothing Fastener(s)

A detail of a garment having the function of facilitating the opening or closing of a garment; the examples used in this study include buttons, zippers, Velcro (a registered trademark), and snaps.

##### 1.4.2 Hand Ability

Refers to the functional ability of each hand in terms of:

1. grip strength, indicating total grasping power
2. co-ordination and dexterity, indicating finger-thumb prehension

##### 1.4.3 Manipulative Ability

A term to describe:

1. the ability to operate the mechanism of opening and closing each type of clothing fastener
2. the perceived difficulty of managing each type of clothing fastener

##### 1.4.4 Preference

A term to describe:

1. perceived ranking of clothing fastener attractiveness
2. perceived rating of each type of clothing fastener for use in different front closure garments

#### 1.4.5 Rheumatic Diseases

Term to describe a variety of joint disorders which are classified as either inflammatory or non-inflammatory. The joint involvement of this disease may affect a single joint or several in combination with a systemic disease. The following are some of the major rheumatic diseases:

1. Rheumatoid Arthritis - is a chronic systemic disease with a course characterized by exacerbations and remissions. It is a disease of the synovium which manifests itself through pain, swelling, inflammation, stiffness, general weakness, and fatigue. The incidence of rheumatoid arthritis occurs more frequently in females than in males, in a ratio of approximately three to one. Although rheumatoid arthritis may affect any joint, it usually involves the peripheral joints (hands, wrists, feet, ankles, hips, elbows, and shoulders) and the cervical spine. This joint involvement is usually bilateral or symmetrical in occurrence. (23)

A rheumatoid variant, 'Psoriatic Arthritis', is associated with severe psoriasis in which the terminal interphalangeal joints are classically affected. (9)

2. Osteoarthritis or Degenerative Joint Disease - is a non-inflammatory, degenerative joint disorder caused by deterioration of articular cartilage, hypertrophy of the bone at the margins, and changes in the synovial membrane, accompanied by pain and stiffness. (23) Osteoarthritis is more prevalent in the older population with the greatest incidence occurring during the sixth decade. (6) This disease commonly affects the weight bearing joints

such as the spine, hips, knees, and ankles. It also affects the terminal joints such as the fingers as well as any joint secondary to trauma, stress, or infection. (23)

3. Systemic Lupus Erythematosus (SLE) - is a systemic inflammatory disease characterized by small vessel vasculitis with a diverse clinical picture depending upon the organ systems involved. This disease is more predominant in the female population. (23)
4. Progressive Systemic Sclerosis (PSS) or Scleroderma - is a generalized disorder of connective tissues, characterized by fibrosis and thickening of the skin and internal organs. Three out of four patients with this disease are women. (23)

#### 1.5 ASSUMPTIONS

It is assumed that joint involvement in the hands and wrists, regardless of type of arthritis, affects one's functional ability. It is therefore assumed that any decrease in functional hand ability (as determined by grip strength and hand dexterity) influences one's capability to open and close different types of clothing fasteners. It is also assumed that different types of clothing fasteners require varying levels of ability to manipulate.

#### 1.6 LIMITATIONS

This study was limited to arthritic women who experienced some form of hand dysfunction due to either (or both) inflammatory or non-inflammatory forms of joint disease.

### 1.7 DELIMITATIONS

The sample for this study consisted of fifty arthritic women who experienced some form of hand dysfunction. These subjects verbally indicated that they were able to dress themselves. In order that an in-home interview could be accomplished, only women in the Winnipeg area were contacted. The scope of this study was therefore limited to those arthritic women who volunteered to participate.

## Chapter II

### REVIEW OF LITERATURE

The first section of this chapter will summarize the general scope of the research done in the area of clothing for the handicapped, and will then focus more specifically on the literature pertaining to the clothing needs of the arthritic. The second section will be aimed at discussing the basic physical, psychological, and social needs that have been identified in the literature as relevant to all those who are disabled. The final section will focus on clothing designs for the handicapped, and will discuss the general principles of both the custom design of garments and the selection of ready-to-wear garments which suit their specific needs. It will also seek to identify the means of achieving self-help features in both ready-to-wear and custom clothing. According to Levitan-Rheingold, Hotte, and Mandel, such features include "... cut of garment, sleeve style, collar, or neckline style, type of closure and fastener, and fabric." (18:72)

Literature pertaining to clothing for the handicapped has, for the most part, been scattered and fragmentary (16:3), (41:39). Until recently, little emphasis has been placed on collating the available clothing information resources that are applicable to the handicapped or to those persons involved in the field of clothing for special needs. In the literature written before 1977, much of the research was concentrated on establishing "functional features that are important to consider when

selecting, designing, or adapting clothing for a disabled individual." (18:72) Another focus of attention has been on design resulting from individual case studies (3, 22, 32, 37, 38, 39, 40), with emphasis placed on the need for future research. The results of such studies have put into perspective the clothing problems of the disabled and the types of research that need to be pursued.

One area of research that has been fruitful is aimed at the identification of functional design features in garments, which promote easier dressing for the physically disabled. As a result of such research, the concept of 'self-help' dressing was formed and became an acknowledged goal in clothing design for this group. The publication Functional Fashions for the Physically Handicapped by Helen Cookman and Muriel Zimmerman, is a good example of the initial research attempts to provide guidelines in clothing for the disabled. Both of the aforementioned authors have been leaders in creating functional features in garment designs, and their clothing research project generated considerable interest in creating clothing designs for various needs of the disabled. (see Appendix A)

Other notable early works in clothing research for the handicapped were carried out in London, England through the 'Disabled Living Foundation', chaired by Lady Hamilton. Through the extensive use of surveys, publications concerning clothing, footwear, and other aspects of daily living were made available. (see Appendix A)

Little research, however, has been done on the dressing process itself or on how disabilities can influence clothing choices. This apparent lack of knowledge has been noted by Levitan-Rheingold, et al (18).

One major contribution that has been made in this field is the Disabled Living Foundation publication, Dressing for Disabled People [1977] written by Rosemary Ruston. This publication (30) was intended for nursing personnel and others who needed to be acquainted with the dressing skills, methods of dressing, and clothing requirements of disabled persons.

It has not been until the last few years that interest in clothing for the handicapped has been sparked in Canada. An attempt at rectifying this lack of knowledge has been initiated by such researchers as Dr. Anne Kernalleguen of the University of Alberta. Dr. Kernalleguen's most recent publication, Clothing for the Handicapped [1978], clearly summarizes important concepts in the areas of garment design, selection, and adaptation that are currently considered to be highly acceptable solutions to various clothing problems encountered by the handicapped. Her book provides both the professional and the novice with ways and means of handling these various clothing problems. (16)

Another important area of investigation is one that has been developed through the research conducted by Reich and Shannon (33, 28). A joint effort was launched by these researchers in order to establish a data base concerning the clothing and related needs of the physically handicapped. This venture involved an intensive survey conducted in Arizona in an attempt to

... categorize the common physical limitations from the various disabilities and to identify the types and kinds of information physically disabled persons require regarding their clothing and daily living activities. (33:2)

One offshoot of this study has been a recent publication compiled by Reich, Otten and Carver entitled Clothing for Handicapped People: Anno-

tated Bibliography and Resource List (27). This represents one of the few examples of the collation of currently available resource materials.

Research pertaining to clothing for those suffering with arthritis has also been limited. Two notable publications that have been written in the United States are: Flexible Fashions: Clothing Tips and Ideas for the Woman with Arthritis, a Public Health Service Publication [1968] (10) and more recently, as a result of a biomedical science research grant, Clothing Needs of Women with Arthritis by Baer, Dallas and White [1977] (2). The latter study noted the importance of clothing fastener types in terms of their ease of handling when analyzing the clothing needs of arthritic women. Basically, the purpose of this study was to

... evaluate the effectiveness of recommended self-help and comfort features in clothing by examining the arthritic women's ability to manipulate or use these and other more fashionable or conventional garment features (2:5)

This study was based upon the premise that in any form of arthritis, "...joint changes result in pain and limitation of joint motion." (2:3) Arthritis also affects one's ability to do routine tasks such as dressing, since this activity requires

... extremes of joint motion such as shoulder flexion and abduction to put arms in sleeves and garments over the head; fine manipulation of both hands; and sufficient strength to lift and handle clothing and fasteners. (2:3)

In reviewing the responses of the one hundred arthritic women surveyed in the study, it was found that clothing fasteners that were most easily manipulated were the 'no lap' zipper with large teeth, when fitted with a ring tab on the zipper pull, and flat five-eighths inch diameter rimmed buttons with a shank, coupled with a vertical buttonhole (2:21). It was found that garments with a center front opening extend-

ing to below the waistline, and one piece dresses without a waist were most preferred by these women (2:21). Baer, Dallas and White (2) concluded that these women were largely influenced by conventional garment styles and availability, and that perhaps this fact hindered the acceptance of self-help and comfort features as preferred items among this group of women.

Their study was an attempt to relate physically disabling conditions with both the ease of manipulation of clothing fasteners and garment preference among arthritic women. However, it should be recognized that clothing needs are not entirely restricted to any particular group of handicapped individuals regardless of the cause of their disability, but are rather a reflection of the resulting disabling condition itself. It is evident from the literature that clothing needs are universal among the handicapped population regardless of the type of disability; it is with this in mind that the next section will deal with the general clothing needs of the disabled.

## 2.1 CLOTHING NEEDS

Regardless of age, sex, or physical ability, clothing is considered to be a visible extension of oneself, reflecting one's physical, psychological, and social wellbeing. Clothing for the handicapped is one segment of the clothing spectrum that must be especially sensitive to the wearer's specific physical, psychological, and social needs. Regardless of the type of disability, be it permanent or temporary, physical or mental, clothing must fulfill the basic requirements outlined above.

First, the physical needs of clothing for any handicap are more apparent in terms of comfort and function than for an able bodied person. Clothing considerations for physical well-being that should be taken into account are: safety, easy upkeep, and the provision of physical comfort - all of which represent definite priorities when choosing garments for the handicapped. Satisfying these needs is only one portion of the many considerations affecting not only the purchase of clothing for the handicapped, but also the conception of garment design and garment modification in both custom and ready-to-wear clothing.

The second basic need that clothing must fulfill is that of psychological maintenance. This need is particularly crucial in terms of rehabilitation, in that clothing is very important in promoting a healthy and positive self image. Therefore it is important that clothing for the handicapped should promote independence in dressing and provide a basis for psychological comfort. One way in which this aspect may be attained is through actual concealment of the particular handicap by the type or style of clothing worn.

The third basic need that clothing must meet is that of social or societal acceptance. To promote the acceptance of the disabled into society, their clothing appearance should be comparable to that of others. That is, their clothing must be both fashionable and 'conventional' in appearance in order that they do not appear to be different from others. Each of these basic needs will be discussed individually.

### 2.1.1 Physical Needs

Physical needs can be viewed in terms of how textile and design considerations contribute to the general comfort and function of the garment. The priority of each consideration is dependent upon the severity or the degree of immobilization that the disability creates. Some of the textile considerations for clothing for the handicapped are as follows:

"Durability" or strength of the fabric used in clothing for the disabled is basically dependent upon whether the fabric is woven or knitted (21). Man-made (synthetic) fabrics such as nylon and polyester are generally more resistant to abrasion. Kernaleguen (16) states that tightly woven and knitted fabrics generally are stronger; however, woven fabrics stand up better to abrasion problems such as snagging and pulling resulting from various equipment such as mechanical devices, braces and crutches. Ruston (30) recommends lining garments whenever possible since the extra fabric layer lengthens the lifespan of the garment, especially in areas where excessive strain is placed on the fabric due to prosthetic devices or where one part of the body is in constant friction with another part, creating pressure points. Cookman and Zimmerman (8) also agree that the fabric in garments for the handicapped should be able to withstand an increased degree of pulling, maneuvering, and contact with metal appliances. They feel that choosing a strong fabric will eventually reduce the costs of clothing purchases.

Textile factors that make a garment comfortable to wear are warmth, weight, elasticity, texture, moisture absorption, and the prevention of static electricity build up.

"Warmth" or thermal insulation qualities are inherent characteristics of textile fabrics, which trap layer(s) of air around the body and thus prevent heat loss. Warm fabrics include wool, fur, fabrics with a pile, and quilted fabrics. On the other hand, cool fabrics are those which allow air circulation around the body. Such fabrics include thin, loosely woven, or knitted ones. (16, 30)

Depending on how ambulatory a handicapped person is, the "weight" of the fabric will have a definite bearing on clothing choice. Basically, heavy clothing has a tendency to restrict movement and also makes it difficult to remove. Lighter weight clothing promotes freer movement and consequently is less confining in the dressing process. Ruston (30) recommends that disabled persons should wear clothing that is both warm and light. Cookman and Zimmerman (8) also encourage light weight clothing especially for those persons with weak hands and arms.

Fabrics that have some "elastic properties" aid in giving additional stretch to a garment, thus reducing the risk of seam rupture. Stretch attributes can be achieved through the use of knitted fabrics. Ruston (30) advises the use of fabrics made with elastomeric yarns, and garments made with fabric cut on the bias to increase structural movement. In addition, Cookman and Zimmerman (8) suggest using a closely woven fabric that will hold its shape and yet will not bag.

The "textural quality" of fabrics is another textile consideration according to Ruston (30), that can make a garment pleasant or unpleasant for the wearer. Fabrics that feel soft and warm usually contain a larger proportion of natural fibres. Stiff, unyielding fabrics have a tendency to crease and make it very uncomfortable for those persons who

must sit for long periods of time or who are confined to a wheelchair. If the transferring of the handicapped person from seat to seat is a major concern, fabrics that are smooth and slippery will permit easier sliding.

Allergies to both natural and synthetic fabrics should also be taken into consideration when choosing fabrics. Kernaleguen (16) advises the use of cotton since it seldom contributes to an allergic reaction. Other skin irritations may develop depending on the texture of the fabrics used; for example, woolly fabrics may be particularly annoying to those with sensitive skin. In this case Kernaleguen (16) suggests using soft, absorbent fabrics to reinforce areas where the skin comes into contact with the irritating fabric.

"Absorption" is another important textile factor that must be taken into account when choosing fabrics. Since perspiration is a normal physiological function, excessive moisture can be a contributing factor to general skin irritation or may simply be uncomfortable, especially for those who are non-ambulatory. Generally, it is necessary for perspiration to be absorbed through the air or clothing if physiological comfort is to be maintained. Natural fibres tend to be better in this regard. Fibres that are relatively high in absorbency include the natural fibres and viscose rayon, whereas, those that are particularly low in absorbency qualities include such fabrics as polyester or polypropylene. (10, 30)

"Static electricity" is particularly evident in fabrics that have a low degree of absorbency. This is a particular concern for clothing for the handicapped since, according to Cookman and Zimmerman (8), static

electricity is created during the transferring or sliding process, and by the presence of metal prosthetic devices, thus causing fabrics to cling or resulting in shocks. Natural fibres and blends with a minimum of 35% natural fibres are relatively static free. (16, 30)

"Odor retention" is an unpleasant textile property, to which synthetic fibres are particularly susceptible. Polyester fibres especially retain body odor to a greater extent than any of the natural fibres. Kernaleguen (11) contends that anti-bacterial or bacteriostatic finishes can be applied to fabrics to inhibit the growth of any unpleasant odor-causing germs.

"Launderability" of fabrics is an important factor in any garment, especially those that are subjected to harsh conditions in commercial or institutional laundry facilities. Wrinkle resistance and soil or stain resistance are other fabric qualities either inherent or applied, that contribute to the easy maintenance of garments. Such attributes also reduce or eliminate the need for ironing. (10, 30)

Safety features within fibres and fabrics are another important textile consideration. "Flammability" is perhaps the most critical of all the safety features. Those persons that are hampered by limited mobility are especially susceptible to the dangers of fire. To minimize fire hazards, Kernaleguen (16) lists both good and bad fibre/ fabric choices. Ruston (30) also lists similar choices but categorizes them according to those that flare - for example, cotton, linen, rayon, cellulose, acrylics, and acetate; fibres that melt - for example, nylon, polyester, and flame-resistant acetate; and fibres which smoulder, such as wool and silk. She also mentions flame-retardant fibres such as Nomex nylon,

chlorofibres, modacrylics, and flame-retardant rayon as alternative choices. Both Kernaleguen (16) and Ruston (30) state that flame-retardant finishes can be applied to the fabrics, but that caution must be observed when laundering these fabrics. According to Kernaleguen (16), these fabrics should not be washed in alkaline soap and hard water or in non-phosphate built detergents since these products tend to diminish the effectiveness of the flame-retardant properties.

"Slipperiness" is another safety feature that must be taken into account, especially for those persons who lack stability when rising from a chair or while they are being lifted. Smooth, shiny fabrics such as nylon are particularly hazardous.

The choice of textiles is a contributing factor in providing physical comfort to garments. Textiles also provide inherent fibre/fabric properties that enhance physical clothing function. Another factor essential for the provision of comfort and function is that of garment design. This factor will be discussed in greater detail later on in the section dealing with clothing designs for the handicapped.

#### 2.1.2 Psychological Needs

Psychological maintenance is the second basic need that clothing provides. This requirement is particularly evident in those who experience some form of disabling condition such as limited muscle strength, limited range of motion, lack of mobility, reduced sensation, curvature of the spine (for example kyphosis, lordosis, scoliosis), or the reliance on crutches, braces, or wheelchairs. Clothing for those who are disabled - whether their handicap is permanent or temporary - must be appro-

priate and yet manageable in relation to the limitation imposed by the disability, and not necessarily by the cause of the disability itself. In other words, design must be aimed at the limitations experienced by a handicapped person, whatever their cause or causes. However, as Kernalleguen states,

... a disabling condition is not always a handicap and many able bodied persons suffer from handicaps perceivable only to themselves, while many disabled people are coping so well that their condition poses no handicap to them. (16:3)

Thus, it is evident that a handicapped person is aware of his or her limitations with respect to their disabling condition.

In the rehabilitative sense of improving one's capacity to perform activities of daily living, dressing provides not only a physical but also a psychological stimulus for achievement (26). Since clothing "... is one of the most powerful forms of non-verbal communication" (24:19), it provides an avenue through which a positive sense of well-being can be obtained. Clothing plays a vital role in any rehabilitation program by providing both a visual and physical tool for easing the restoration of lost physical function and building up of one's body image. Maintaining and/or improving one's self image or self concept is an important aspect of rehabilitation, and Kernalleguen observes that clothing is significant to the total rehabilitation of the physically handicapped. She states that

The satisfaction gained from independence in self-dressing as well as the pride and enhanced self-esteem that come from looking attractive, and in turn, the favourable reactions which that elicits from others, are all conducive to psychological wellbeing. (17:135)

Ruston (30) also views the value of clothing and the entire process of dressing as an effective rehabilitation tool, aiding not only the physically handicapped, but also those who are mentally incapacitated.

Greater independence in dressing can be achieved by employing self-help features in garment designs, modifying ready-to-wear garments to the level of easy access, in terms of donning and removing garments; and providing clothing fasteners that can be easily manipulated. The aesthetic appeal of a garment is particularly important if a favourable self-image is to be developed. The appearance and comfort of clothing is vital to stimulating and achieving a high level of self-esteem. (1) Thus, the attitude of the physically handicapped is crucial if a rehabilitation program is to succeed. If the person feels good in the clothes he or she wears, the potential for that person to succeed in learning and accomplishing tasks essential to cope with a disabling condition will be increased.

Trombly and Scott recommend in their approach to rehabilitation that adaptive techniques be utilized first instead of equipment "... because they make the person's life more flexible and independent." (25:333) Essentially, their approach to rehabilitation, in an occupational therapy sense, is

... a compensatory approach appropriate for patients who need to live with a disability on a temporary or permanent basis. The theory of this approach focuses on the use of a person's remaining strengths to achieve the highest level of independence possible for that individual in occupational tasks. (35:333)

An alternative method of achieving dressing independence, when adaptive techniques are not sufficient, is to utilize assistive devices. The use of commercial and home-made dressing aids such as dressing sticks, button hooks, reaching aids, and other devices enables the disabled person with a limited range of motion and/or strength to extend their reach and increase their ability to perform both the fine and gross manipulations associated with dressing. (30, 35)

Clothing design considerations also greatly affect the level of independence a disabled person can achieve. Such considerations will be discussed later under the section dealing with clothing design.

### 2.1.3 Social Needs

One of the basic needs that clothing for the disabled should meet is that of promoting social or societal acceptance. In the realm of social 'acceptability', it is evident that conforming to one's social group is partly achieved through the type or style of clothing worn. Such clothing behavior is culturally bound in that few people would even consider deviating from what has been established as the norm for that particular group. As Horn points out,

The compelling nature of fashion is beyond the control of any single individual; its power lies in the collective definition of the clothing norm. (14:200)

Despite their position outside this 'clothing norm', those with a disability are not necessarily considered deviants in clothing behavior.

However, Kernaleguen strongly suggests that

If we want the physically handicapped to be independent, to take their places in the labor market, to associate with others and to look after themselves as much as possible, then we must provide the right environment for that individual in which to function. Part of that environment is the clothing he wears. (17:135)

For the handicapped, as with able bodied persons, clothing serves as a means of identification with others. According to Kernaleguen (16, 17) when physical limitations affect the outward appearance of an individual, clothing emphasis must be placed on conforming in appearance to peer group standards and fashion. In other words, the appearance of their clothing should be comparable to that of others in that group. In

her estimation, such conformity "... contributes to the social adjustment of the physically disabled person." (17:135) Newton (24) also emphasizes the importance of fashionable appearance in clothing for the handicapped in order that integration into other societal groups is made possible. However, she points out that

Because of the limited market, the vast variety of requirements for different handicaps and the rapidly changing clothing styles, it is not economically feasible to mass produce such clothing. It is necessary to emphasize the possibilities of making adaptations in ready-to-wear garments. (24:20)

A similar conclusion is found in Kernaleguen's philosophy for the disabled. She recommends that clothing for the handicapped should be

... regular clothing with added inconspicuous features or modifications designed to maximize the personal satisfaction of the wearer by accommodating his individual needs. (16:3)

Garment design incorporates not only physical and psychological needs, but also social needs for the attainment of comfort, function, and aesthetic appeal. Generally speaking, all clothing designs, to varying degrees, must fulfill these basic needs and their requirements, especially for those disabled persons requiring special clothing. It is with this in mind that the next section will focus on the implications of promoting clothing design considerations for the handicapped.

## 2.2 CLOTHING DESIGNS FOR THE HANDICAPPED

Clothing design considerations for the handicapped vary according to the disabling condition. However, regardless of disability, the basic needs that have been discussed previously all play an important role in the design of garments for those requiring 'special' clothing. This section will deal more closely with the aforementioned needs and how these needs

can be incorporated into the design of garments. Similar implications for ready-to-wear clothing for the handicapped will also be discussed.

First, the focus in this section will be on general design principles that are applicable to garments for the disabled. It has been implied in the literature that regardless of the physical incapacities that these people may experience, their clothing should not be ignored as a vital component in maintaining their general well-being. It might be pointed out that this is also true of any individual, and that the handicapped should not be singled out as an 'abnormal' group but rather as an extension of the common clothing needs and desires found in the general populace. Although much of the literature has been aimed at clothing for adult women, the principal techniques may be easily adapted to clothing for men and for children as well.

The second focus in this section will be aimed at identifying means for modifying ready-to-wear clothing to increase independence in dressing. This section will also delineate the use of clothing fasteners as a means of enhancing functionability without necessarily reducing the fashionability of garments.

### 2.2.1 Implications for Dressing

To understand the full process of garment design, one must take into consideration the way in which one dons and removes his or her clothing (5). For an able bodied person the complex interaction of physical and mental abilities needed to dress is easily taken for granted. Dressing is indeed a complex activity involving not only the use of muscles and joints, but also other factors including balance, agility, co-ordina-

tion, and dexterity. Lowman and Klinger have identified the following factors as necessary to analyze one's ability to dress:

1. The extent, location, and degree of limitations, i.e., reach to the back of the neck, waist, or feet. Is the limitation caused by lack of strength or restricted motion?
2. The ability to grasp in order to pull on clothes and manipulate fastenings.
3. Hand dexterity and coordination to manage fastenings.
4. Sitting balance in a chair, bed, or wheelchair.
5. The ability to reach with arms and hoist buttocks or arch back and roll to pull on garments. (20:117)

The authors stress the need for the above evaluation before a wardrobe for a handicapped person is selected. Broome (4) voices a similar concern that evaluation take place before garments are purchased. In addition, Ruston points out that dressing involves a level of mental competency, that is, an understanding of the "... concepts such as inside and outside and top and bottom,...the choice of suitable clothes, and knowledge of the correct order in which to put them on." (30:6)

### 2.2.2 Garment Selection

Clothing for the handicapped, according to Newton, creates problems in the selection of suitable clothing. She reiterates that

People ordinarily use a considerable amount of coordination, sensation, dexterity, sense of balance and range of motion, plus muscular strength in the dressing procedure. Many disabilities deter one or more of these dimensions, leaving the ability to dress oneself limited or impossible. Other deterring factors affecting the dressing process are pain, discomfort, fatigue, fear, confusion, agitation, loss of concentration, interest and memory, and an increased dependency on others. (24:22)

It becomes apparent that depending upon the disabling condition, the process of dressing can be very trying for a handicapped person. The dressing procedure can be so exhausting or painful for some that it may lead to the habit of wearing night attire or dressing gowns all the time. Reich also warns that

... if a person cannot find suitable clothes that he can fit into because of his particular problem, he may not be able to dress appropriately for his role. This can burden an individual with emotional stress and generate feelings of frustration and deprivation. No matter what a person's physical capacities, he does not want to appear different from other people. (26:290)

It becomes increasingly essential, according to Rusk and Taylor, that clothing for the physically handicapped should be styled to alleviate clothing problems and be centered around the

... (1) design to permit greater ease in putting on and removing garments by individuals with limited muscle strength and limited range of motion in the various joints and by individuals who rely on braces, crutches, wheel chairs, and other mechanical aids; (2) design to permit greater social acceptance and increase self-esteem by severely disabled persons; (3) fabric choice to resist the undue wear caused by greater tension on the cloth as a result of the more strenuous physical activities required by certain disabled persons in dressing and undressing; undue wear caused by the friction of braces, crutches, wheel chairs, and other appliances and devices; and laundering and related care of clothing. (29:1598)

Friend, Zaccagini, and Sullivan (11) also suggest that clothing be styled to include openings in garments that can be easily reached and fasteners that can be easily manipulated. They also believe that the garments should be attractive and 'fashionable'. This last suggestion is also voiced by Lowman and Klinger (20) when dealing with the selection of garments for the physically handicapped. Reich expresses the feeling that

Designing clothing suitable for handicapped persons requires a bit more planning than necessary for ordinary clothing. One

factor of clothing for the handicapped that distinguishes it from ordinary clothing is that it generally contains hygienic and functional factors. (26:291)

Hence, according to Hindshaw and Barrier, it would seem that "... the ultimate objective is to provide clothing for the handicapped person that looks as well in public as it functions privately." (13:9)

The need for careful design choices is apparent in selecting garments for the handicapped. One possible way to view the limitations of a disabling condition is to examine how clothing is placed on the body. In other words, as in Brown's view, clothing "... may be wrapped around the body, placed over the head or drawn over the feet." (5:604) Therefore, a person's physical limitations may aid in the choosing of suitable clothing by means of reviewing how they are donned and removed (see Appendix B). Thus, the process through which a person gets in and out of a garment is important in activities of daily living. Those persons with limitations need to learn how to utilize their remaining abilities in order to dress. According to Levitan-Rheingold, Hotte, and Mandel,

Individuals who have limited range of motion, arm or hand weakness, paralysis, or other physical limitations need to be able to develop the basic skills that are required to manipulate the body in and out of the intricacies of various clothing items. It is the intricacy of the garment design features that make dressing a difficult task. Often disabled persons are taught how to dress and undress using their own clothes. This approach overlooks the role that the garment design features play in the learning process. Garment design includes: cut of garment, sleeve style, collar, or neckline style, type of closure and fastener, and fabric. (18:72)

### 2.2.3 Garment Attractiveness

The desire to be 'fashionable' is a concern not only for physically disabled persons, but also for able bodied persons. To wear clothing that is attractive and becoming in terms of colour, fabric choice, and garment design, contributes to the wearer's sense of 'feeling good' about herself according to how she perceives that others view her. According to various authors, such as Warden and Dedmon (36), Schwab and Sindelar (31), Yep (41), Broome (4), and Lowman and Klinger (20), the desire to wear stylish clothing which is socially acceptable illustrates the value of attractive clothing in boosting morale. Such an increment depends on the extent to which the appearance of the physical deformity deviates from what is recognized as being 'normal'. It is stressed by these authors that looking attractive or striving towards a conventional appearance ensures that the handicapped will not be viewed as being different from the norm. Careful consideration in choosing garments and conceiving clothing designs is therefore important, as Lowman and Klinger point out that

A neat, attractive appearance is based on selection of clothes not only to complement the individual's coloring and build but also physical deficits and posture. (20:96)

### 2.2.4 Self-help Clothing Features

Attractiveness is one of the underlying concepts in garment design. Another factor which is particularly crucial in designing for the handicapped is the idea of 'self-help' features. Such a concept involves making the garments easier to put on and take off. Self-help features may be incorporated into the actual design of the garment silhouette or

they can be added to ready-made clothing. The latter possibility has practical limitations in that the total self-help features can seldom be fully accomplished within the confines of the already constructed garment designed for the able bodied. However, it cannot be denied that this is perhaps the easiest and cheapest approach to solving clothing problems for those who cannot afford custom designed clothing. (17)

However, Reich cautions that

These self-help features should not be achieved at the expense of attractiveness or make the garment appear too different from those worn by others in society. It is extremely important that functionability not be the sole requisite to clothing for the handicapped, to the exclusion of attractiveness and fashion rightness. For everyone, clothing needs to be pleasing to the wearer. (26:292)

The other aspect of self-help features in garments is to promote greater independence in dressing. According to Levitan-Rheingold et al, this independence is dependent upon the fundamentally learned skills of "...thrusting, pulling, pushing, grasping, and adjusting (which) involve the appropriate muscle coordination and gross motor development ..." that are needed to manipulate a garment on the body (18:73). Audrey Newton aptly points out that

If a design idea saves time and energy, or aids in getting into or out of a garment, it could also become important to the rest of society, and thus be incorporated into the ready-to-wear market. (24:21)

However, many authors believe that the cost of clothing designed and produced on a large scale specifically for the needs of the handicapped would be beyond the reach of most disabled people. Kernalguen (17), Warden and Dedmon (36), Reich (26), Newton (24), Broome (4), and Cookman (8), generally agree that attention should be focused towards selecting ready-to-wear garments with self-help features and then to adapting them

to individual needs. The impracticality of the mass production of clothing for the handicapped is further illustrated by Hallenbeck in that

... because of overweight, limb atrophy or hyper-development, and the like, disproportionate measurements are the rule rather than the exception, and regular sizes seldom suffice. (12:35)

Thus standardization, which is the basis of the techniques of mass production, hinders the possibility of producing specialty clothing for the disabled. Designing for such a non-standardized group may therefore seem impossible, according to Reich,

Because we are so technologically advanced in our society, we are geared toward mass production and standardization. These two factors make it seemingly impossible to stop the assembly line to review the complex problems that certain persons may have. The problems that the physically handicapped face are all very diverse and thus do not facilitate standardized solutions. (26:291)

It can be seen according to Kernaleguen that progress has been made - especially in the manufacturing of sportswear, in that

Practicality appears to have filtered through to the designers and manufacturers to the degree that fashion follows functionalism. Emphasis on both function and fashion in construction and design has produced garments suited to anyone, and this has perhaps helped to dispel the idea of clothing specifically designed for the disabled and worn only by the disabled. (16:15)

Although this may only be a token example of mass produced clothing that is functional for everyone, disabled or otherwise, the emphasis in the literature is still being placed on modifying or adapting ready-to-wear clothing to suit individual needs. However, in terms of mass produced garments, the approach to clothing for the handicapped should be, according to Reich "...conceived in the broadest possible terms, to reach the largest amount of people. Individually designed clothing is not the

most satisfactory answer." (26:292) Cookman and Zimmerman maintain much the same philosophy in that

... the concept is not a different design for each physical disability, but rather basic designs that offer solutions to the common problems involved in many differing types of disabilities. (8:6)

In general terms, the manner in which garment design can be made more functional is through the incorporation of features such as looser fit, especially across the shoulders; sleeve designs that do not impede or restrict shoulder or arm movement, such as raglan or kimono; sleeves with extra wide armholes and sleeve width; roll-up or short sleeves; three-quarter length sleeves which give added warmth and yet do not get in the way of propelling a wheel chair (for example); the use of gussets and action pleats; front, off centered or side openings; front pleated A-line, or flared skirts; wrap style garments with a generous overlap; and so on. A more detailed outline of design considerations that need to be taken into account when choosing garments is found in Appendix C.

One vital component of any garment is the functional and aesthetic one provided by clothing fasteners. According to Talon manufacturers, the original intent of garment fasteners were

... to make dressing easier, but whether this is true for people who have visual problems, are one-handed, or lack hand coordination, depends on the types, the size, and the location of the fasteners. Closures are the greatest single problem in dressing for this special group. (34:7)

Clothing fasteners appear to be perhaps the easiest and yet most challenging aspect of a garment which requires modification. Hence, the convenience of the fastener's location, plus the ease of its manipulation are important when selecting ready-to-wear clothing which is to be modified according to an individual's needs (20). Also, the maintaina-

bility of the garment as provided for through its design may be another factor when selecting a garment. Consideration must also be made of the degree of physical impairment or immobility that the person experiences. For example, according to Trombley and Scott (35), those with limited range of motion in the fingers may find that the use of Velcro fasteners instead of buttons or hooks aids in ease of fastening. If one experiences decreased strength, especially in the 'pinching' action, then the addition of a string loop, ribbon, leather lacing, or metal ring attached to the zipper pull may facilitate a hooking action with the finger or thumb. This last suggestion may also be utilized for those experiencing some loss of co-ordination.

Generally speaking, the size and type of the fastener is important, depending once again on the degree or type of limitation. Authors in the field of clothing for the handicapped agree that the buttons should be large (minimum of five-eighths inch diameter), flat, and have a plastic or thread shank to facilitate easier grasping. Fabric covered or ball shaped buttons are not recommended. Also, it is recommended that horizontal buttonholes be employed, when possible, since less strain is placed on the fabric than when vertical buttonholes are used (8, 16). However, Baer, Dallas and White concluded in their study that vertical buttonholes were preferred in terms of manipulation (2). Macartney (21) also notes that although vertical buttonholes are easier to fasten they may cause undue crosswise stress in the fabric.

According to Lowman and Klinger, Velcro fasteners require minimal dexterity to manipulate (20), and their pre-cut form is generally easier to manipulate than the long continuous strip, depending on where the

Velcro is located on the garment. Also, continuous nylon spiral zippers are stronger and easier to use than conventional metal or invisible zippers. The nylon coil also has the advantage of not catching on fabric or skin. As was mentioned previously, the addition of ribbon, metal rings, or decorative ornaments will increase the area of grasp in the zipper pull. A summary of fastener attributes for consideration in garment use for the physically handicapped is presented in Appendix D.

## Chapter III

### METHODOLOGY

Since this thesis focuses on one segment of the handicapped population (women with an arthritic hand dysfunction), the third chapter will review the methods and procedures used in examining their ease of manipulation and preferences in relation to certain clothing fasteners.

The first portion of this chapter will discuss the methods for sample selection and a description of the obtained sample. The next section will review the development of the testing instruments and the resulting recording/interview schedule. Following this section will be a synopsis of the testing procedures used for the in-home interviews. The last section of this chapter will be devoted to discussing the means for testing the hypotheses and the analysis.

#### 3.1 SAMPLE SELECTION

Due to the parameters set by the nature of this study, the method for sample selection was non-random. In addition, the decision to obtain data for the study through home interviews meant that the selection of the subjects was limited to those within the Winnipeg area. The two main sources for the selection of subjects to be interviewed were the "Arthritis Society Women's Auxiliary Group" and the "Arthritis Society Self-Help Group". Both of these groups were open to men and women, but the majority of the membership was found to be female. The former is

comprised of members who were referred to the group, either through their doctors or through one of the therapy services. The latter group's membership is open to all arthritics who are willing to pay a membership fee.

For this study, a total of fifty women were contacted either through personal visits to their group or through telephone solicitation. The criteria set for selecting subjects were first, that the subjects were to be women suffering from arthritis (any type), and whose hands were affected; and second, the subjects were to be limited to those women who considered themselves to be able to dress themselves independently.

The investigator requested permission from the executive members of each group before attending their meetings. Both groups were visited at one of their regularly scheduled meetings; the "Self-Help Group" was visited in early May, 1980, while the "Auxiliary Group" was visited in late September, 1980.

At the time of the meetings, the investigator introduced herself to the members and explained both the purpose of the study and the need for volunteers to participate. The investigator also reiterated that all testing was to take place at the subject's own residence. After this initial address, the investigator approached all interested members in order to obtain both a verbal consent and to schedule a convenient time to visit each individual. Those members who were not in attendance at these meetings were contacted by telephone. The remaining subjects for the sample were obtained either from referral by members of the two groups, or through personal acquaintances with the investigator.

### 3.2 DESCRIPTION OF THE SAMPLE

All fifty women selected for the study have some form of hand dysfunction due to either (or both) inflammatory or non-inflammatory forms of arthritis. The majority of the subjects interviewed stated that they had rheumatoid arthritis, whereas others stated that they had rheumatoid arthritis in combination with one of osteoarthritis, psoriatic arthritis, systemic lupus erythematosus (SLE), progressive systemic sclerosis (PSS or scleroderma), or simply one of the above.

Because of the diverse nature of arthritis, varying degrees of physical affliction were found within this group. A few of the subjects were confined to wheelchairs, and some others relied on the assistance of walking aids for mobility. The visual deformity of the hands and wrists among this group also varied from little or no visible deformity to severe deformity.

In total, twenty-five women from the "Arthritis Society Women's Auxiliary Group", seventeen from the "Arthritis Self-Help Group", and eight women from other sources were tested.

### 3.3 DEVELOPMENT OF THE TESTING INSTRUMENTS

#### 3.3.1 Testing Vests

To evaluate the ability of the subjects to manipulate four different types of clothing fasteners (buttons, zipper, Velcro, and snaps), two sets of adjustable vests were constructed to fit sizes ranging from Junior to Women's. Based on the Canadian Standard System for Sizing (CAN 2-49.201-M78), the following horizontal and vertical controls were chosen to design the vests:

14.1.1 "Neck Base Girth" - the girth of the base of the neck measured with a fine chain which passes over the cervical and the upper borders of the right and left clavicles.

14.1.2 "Bust Girth" - the maximum girth of the body at the bust level with the subjects standing and breathing normally.

14.1.3 "Waist Girth" - the girth at the natural waistline between the top of the hip bone (iliac crests) and the lower margins of the lowest ribs measured without constriction, with the subjects standing and breathing normally.

14.2.17 "Anterior Waist Length" - the distance from the base of the neck at the front to the waist level at the center front. (7:8, 11)

The vests were developed to incorporate both long and short waisted females. Horizontal straps fitted with 'D' rings positioned in the vest back provided adjustability in girth measurements. Some degree of adjustability was given in the shoulder seam area and the neckline at center back through the use of Velcro strip fasteners (see vest design in Appendix E). A light beige, Swiss gabardine, 50% cotton/ 50% polyester blend, machine washable and dryable fabric was chosen for the construction of the vests. This particular fabric was chosen because of its neutral colour, its light weight, its stable weave, and for its smooth yet easy to grasp texture.

In total, two sets of test garments, each comprised of four adjustable vests were sewn. The two sets of vests were identical in appearance, but differed in the front length measurements. Each vest in the set utilized the one type of clothing fastener that was to be tested. For example, buttons, zipper, Velcro, or snaps were sewn to the front opening of each particular vest.

The choice of clothing fasteners for these vests was based upon some of the findings and recommendations expressed in the related literature

(see Appendix D). In this study, the following clothing fasteners were used: For one vest in each set of four, four 5/8 inch (15 mm) diameter buttons with a plastic shank and raised rim were sewn to the left vest front. Vertically placed buttonholes were sewn along the center front of the corresponding right vest front (see Appendix F).

Another vest was fitted with a beige, nylon separating zipper that was sewn without a fabric placket to the vest front. A 30 cm length zipper was used in one set and a 33 cm length zipper was used in the other set. To aid in grasping, a 1 inch (2.5 cm) metal ring was attached by thread to the zipper pull (see Appendix F).

A third vest featured four medium strength 5/8 inch (15 mm) diameter, white Velcro dots (self-gripping fasteners). The hook component of the Velcro was sewn to the substrate side of the vest front whereas the loop component was sewn to the facing of the right vest front (see Appendix F).

For the last vest in each set, four 3/4 inch (18 mm) diameter brass snaps (dome fasteners) were sewn. The socket portion was sewn to the substrate layer and the ball portion was sewn to the facing side of the right vest front (see Appendix F).

To determine hand ability among the subjects, two testing procedures were used - one to evaluate manual dexterity and the other one to evaluate grip strength.

### 3.3.2 Peg Board Test

To evaluate the hand dexterity and co-ordination of each subject, a nine hole peg board was constructed according to the specifications found in the Sister Kenny Institute publication, Technical Manual: Hand Strength and Dexterity Tests (15). This test measures the number of seconds taken by a subject to properly place all nine pegs in the five inch square board, and then to remove and return them to their original container. The wooden pegs used for this test were 1/4 inch in diameter by 1 1/4 inches in length. The holes in the peg board were drilled slightly larger than the diameter of the pegs and were spaced 1 1/4 inches apart (from the center of one hole to the next). A shallow saucer type dish measuring approximately 5 inches (15 mm) across was used to contain the pegs (see Appendix H).

### 3.3.3 Grip Strength Test

To determine manual grip strength for each subject, a sphygmomanometer was adapted according to the specifications cited in Melvin (23). The cuff of the sphygmomanometer unit was rolled up, starting from the bladder end, to a specified circumference of 6 inches (15 mm) under a pressure of 20 mm Hg. A fabric piece was made to wrap around the rolled up cuff to keep it at the standard dimension during testing (see Appendix H).

### 3.4 RECORDING/INTERVIEW SHEETS

To record each subject's ability to manipulate the clothing fasteners while wearing the testing vests, a recording sheet was devised in order to indicate the level of success of fastener manipulation and the observed difficulty encountered. For each fastener type, the following information was recorded: opening and closing order; length of time (in seconds) to open and close; and the degree of alignment difficulty observed during the closing of the fastener.

To ascertain the subject's perceived difficulty in fastener manipulation, interview questions were developed to determine which fastener type was thought to be the hardest and which the easiest to handle; and also the relative difficulty of manipulating fasteners on a ranking scale of '1 to 5', whereby a rank score of '1' would indicate the easiest and '5' would indicate the hardest. Similar questions were developed to determine the subject's perceived ranking of the appearance of the fasteners in terms of attractiveness; and also the relative appearance ranking on a scale of '1 to 5', whereby '1' would indicate the most preferred and '5' would indicate the least preferred fastener.

To determine the subject's preference for clothing fastener types, questions were formulated to determine wearer acceptability in terms of a 'yes', 'no', or 'maybe' (undecided) response for each fastener type as used in various front closure style garments, including blouses, vests, dresses, jackets, and coats.

The last section of the recording sheets tabulated hand ability results. The information that was to be recorded in chart form is as follows: for the peg test, the subject's age and the time it took (in sec-



onds) for the subject to complete the task for each hand; and for the adapted sphygmomanometer test, three readings of grip strength and the average grip strength for each hand. A space for written comments followed these test results (see Appendix I).

### 3.5 PRE-TEST

A pre-test was conducted among five arthritic women according to the criteria specified in this study. The purpose of the pre-test was to observe any possible flaws in the testing procedure, to verify the efficiency of the testing vests, and to test the comprehension of the interview questions and the hand ability tests. It was also possible to estimate the length of time needed for each interview. The results of the pre-test were not used in the final tabulation of this study. The intent of the pre-test was simply a procedural one.

Modifications to the recording/interview sheets were done at this point. Further descriptive data including visual hand deformity, length and type of arthritis, and the subject's age were included in the final draft. Other slight appearance modifications were made to increase recording efficiency.

### 3.6 TESTING PROCEDURE

At the time of the scheduled interview, the investigator once again introduced herself to the subject. Before initiating the testing procedure, the investigator explained the nature of the study and the reason for using arthritic women. A verbal outline of what was to take place during the interview was given, along with a display of the actual test-

ing apparatus. After this brief explanation the investigator requested a written consent from the subject (see appendix J). The subject was assured that her name on the consent form would not be connected in any way to the information recorded during the testing procedure. None of the subjects refused to comply with this request.

The testing procedure was the same for all the subjects. Each subject was first asked to manipulate the clothing fasteners, then asked questions on manipulative ease and fastener preference, followed finally by testing of hand ability.

The order of presentation for the testing vests differed from subject to subject. Out of twenty-four possible combinations, a random choice was made in order to predetermine which order was to be used for each subject. The investigator selected which set of vests was to be worn depending upon the subject's body build. For example, a woman with a smaller frame would be fitted with the shorter waisted vests, whereas a woman with a larger build would be fitted with the longer waisted vests. Before the vest was placed on the subject, the operation of the fastener to be manipulated was demonstrated. Then the vest, with the front clothing fastener closed, was fitted onto the subject. The investigator then adjusted the vest back to fit the subject with a predetermined amount of ease. The vests were placed over the garment worn by the subject; any articles of over-clothing such as a sweater or a jacket were removed first. The subjects were asked to remain seated for the duration of the testing procedure (see Appendix G).

The subjects were instructed to open the fasteners on the vest in any order they wished. The subject was also instructed that if for any rea-

son she felt she could not open or close a fastener, she was to give a verbal indication that she could not proceed. The investigator recorded this along with the opening order and the length of time it took for the subject to open the vest. The subject was then asked to close the vest completely, if possible. The investigator recorded the closing order and time; in addition, she noted whether or not the subject had difficulty in aligning the fasteners when closing. The same procedure was repeated with the remaining three vests in the set. After the subject completed this portion of the test, the investigator questioned the subject regarding the type of arthritis and the length of time she had felt the effects of arthritis. At this point, the investigator made a visual assessment of the degree of hand deformity.

The next section of the testing procedure investigated the subject's perceived difficulty of fastener manipulation and her perceived preference of the fasteners in terms of attractiveness. The subject was asked which of the four types of clothing fasteners she found to be the hardest to manipulate, and which one the easiest. The investigator then asked the subject to rank each individual clothing fastener on a scale of '1 to 5' in terms of relative difficulty of use. Similarly, questions were asked about fastener appearance; for example, the subject was queried as to which fastener type (assuming it was visible on the the garment sometime during wear) she felt was the most attractive and which one she considered to be the least attractive. The subject was also asked to rank each fastener type on a scale of '1 to 5' in terms of relative preference in appearance.

The next section in the interview dealt with the subject's clothing fastener preference in front closure styled garments. The subject was asked to give her opinion as to whether she would wear buttons (zipper, or Velcro, or snaps) in a blouse (vest, jacket, dress, or coat) with a front closure, and her response was recorded. For this question the subject was asked to consider both the ease of manipulation and the appearance value of the clothing fastener in question.

The final section of the testing procedure evaluated the subject's hand ability. The peg board test was designed to determine the subject's hand dexterity and co-ordination. The subject's preferred (or 'dominant') hand was tested first. The peg board was placed on the table in front of the subject, within easy reach. The dish containing the pegs was placed to the side of the peg board to correspond with the hand being tested. The subject was instructed to pick up each peg one at a time and to place the pegs into the pegboard in any order. There was no designated top or bottom to the pegs. Once all the pegs were in the board, the subject was instructed to remove them one at a time back into the dish. The same procedure was repeated with the other hand. (15)

The final indication of hand ability was the determination of grip strength for each hand. Since this test was considered by some [Melvin (23)] to place the most stress on the hand, it was left to the end of the testing procedure. The preferred hand was tested first followed in alternating succession by the other hand until a total of three readings was recorded for each hand. At the beginning of the test the subject was asked to hold her hand in midrotation without resting her arm on the table or on her lap. When the subject was ready to proceed, she was

asked to grasp the rolled-up sphygmomanometer cuff comfortably in her hand and then to squeeze the cuff as hard as she was able without causing too much discomfort. A reading was recorded in mm Hg. The subject was asked to transfer the cuff to the other hand and to repeat the procedure. For this test sustained pressure was recorded and not initial spurts. (23)

The actual testing procedure was approximately thirty to forty-five minutes in length. Due to the nature of this study, total interviewing time varied among the subjects. This time variance was taken into account when the interviews were initially scheduled to avoid any possible conflict.

### 3.7 HYPOTHESES TESTING

To meet the objectives set forth by this study, the following hypotheses, stated in the null form, will be tested to verify the strengths of the association between the variables pertaining to hand ability, manipulative ability, and preference for the four types of clothing fasteners.

1. There is no relationship between hand dysfunction (as determined by grip strength and hand dexterity) and the ability of the arthritic women to manipulate the four different types of clothing fasteners.
2. There is no relationship between their preference ranking for these fasteners and their ability to manipulate them.
3. There is no relationship between their preference ranking for these fasteners and their perceived acceptability of the fasteners when used in front closure style garments.

4. The perceived acceptability of each clothing fastener when used in front closure style garments is not related to fastener handling ease.
5. The perceived acceptability of each clothing fastener when used in front closure style garments is not related to fastener attractiveness.

To test the above hypotheses, an examination of both the variables involved and the crosstabulations needed will be reviewed first. Secondly, since this study is based on a non-random selected sample, a descriptive approach to the data analysis will be pursued. Using the statistical procedures as outlined in the Statistical Package for the Social Sciences (25), non-parametric statistics will be utilized to accept or reject the stated hypotheses. The relative strengths of the hypotheses will be discussed in terms of symmetric lambda coefficient values for each of the crosstabulations specified. Each hypothesis will be discussed separately in the following chapter.

## Chapter IV

### RESULTS AND DISCUSSION

Due to the nature of this study, the interpretive approach in this section is primarily a descriptive one in that the results will be discussed in terms of modal frequencies. The second emphasis will be placed on verifying the hypotheses by analyzing the symmetrical lambda values for each of the specified crosstabulations. It will be on the relative strengths of the symmetric lambda coefficients that the discussions for data analysis will be based.

#### 4.1 SAMPLE DESCRIPTION

Fifty arthritic women were non-randomly selected for this study. The women ranged in age from 31 to 82, with both the mode and the median being 63 years of age and the mean being slightly over 60 (60.06) years old. A subjective measure of the visual hand deformity revealed that about half of the women interviewed had none or slight visual hand deformity while the rest had moderate or severe hand deformity (see Table 1). The length of time these women were afflicted with arthritis ranges from less than one year to over ten years, with the latter category comprising the majority of the sample (see Table 2). The types of arthritis affecting these women also varied. The majority of the women stated that they had either rheumatoid arthritis or had rheumatoid arthritis in combination with another type of arthritis. (see Table 3)

TABLE 1

Degree of visual deformity of 50 arthritic women

| Visual Hand Deformity | Frequency |
|-----------------------|-----------|
| None                  | 4         |
| Slight                | 20        |
| Moderate              | 13        |
| Severe                | 13        |
| Total                 | 50        |

TABLE 2

Length in years of having arthritis of 50 arthritic women

| Number of Years  | Frequency |
|------------------|-----------|
| Less than 1 year | 1         |
| 1 - 2 years      | 1         |
| 3 - 5 years      | 6         |
| 6 - 9 years      | 6         |
| 10+              | 36        |
| Total            | 50        |

TABLE 3

Types of arthritis of 50 arthritic women

| Type of Arthritis             | Number of Respondents |
|-------------------------------|-----------------------|
| Rheumatoid Arthritis          | 37                    |
| Rheumatoid and Osteoarthritis | 3                     |
| Rheumatoid and Lupus          | 2                     |
| Rheumatoid and Psoriatic      | 1                     |
| Osteoarthritis                | 3                     |
| Psoriatic Arthritis           | 2                     |
| Scleroderma                   | 2                     |
| Total                         | 50                    |

#### 4.2 DATA ANALYSIS

For each of the hypotheses proposed in this study, the variables pertaining to the crosstabulations will be discussed first in terms of modal frequencies. Then, for each of the crosstabulations cited, the respective hypothesis will be accepted or rejected according to the relative strengths of their lambda measure of association. For this study it was felt that symmetric lambda values were the most appropriate non-parametric statistic.

The variables that will be discussed are as follows: hand ability, manipulative ability, and preference. Each variable will be reviewed separately.

#### 4.3 LAMBDA (GUTTMAN'S COEFFICIENT OF PREDICTABILITY)

To test each of the hypotheses, the relative strengths of the symmetric lambda values will be used for the analysis. For a better understanding of symmetric lambda, a review of asymmetric lambda is necessary.

Asymmetric lambda represents the proportionate reduction in error measure for association, which is expressed as a percentage. It simply measures the percentage of improvement in the ability to predict the modal value of the dependent variable once the modal values of the independent variable are known (19, 25). In using asymmetric lambda, the dependent variable must be stated since the value of lambda will differ under bivariate conditions. Lambda values range from 0.0 (indicating no improvement in prediction by using the rules of lambda) to 1.0 (indicating that prediction can be made without error). A lambda value of 1.0 (100%) would imply that each independent variable category is associated

with a single category of the dependent variable. Lambda values between 0.0 and 1.0 indicate the various degrees of improvement in predicting modal values of dependent variables when information about the distribution of the modal values for the independent variable is known.

Symmetric lambda measures the overall improvement when prediction is done in both directions in a bivariate condition, and it makes no assumption about which variable is dependent. It is simply a 'kind of average' of the two symmetric values.

In either form, the lambda value set for testing the acceptability of the hypotheses is an arbitrary one. For this study, the minimum lambda value will be set at 0.15 (15% improvement) for analyzing each hypothesis.

#### 4.4 HAND ABILITY

In the context of this study, hand ability will refer to both manual grip strength and hand dexterity.

Grip strength will be classified according to the average grip strengths for the right and for the left hand (AVGR, AVGL). For the grip strength test, three readings of grip strength were taken for each hand and an average grip strength was calculated. Of the fifty women, 49 subjects were able to complete the grip strength test. One subject was unable to grasp the rolled-up sphygmomanometer bladder and consequently results could not be obtained. The pattern of obtained results was broken down into seven categories - six of 10 mm Hg increments (starting from zero), and one representing all responses of 61 mm Hg and over. For both the right and left hand cases, the majority of the subjects had

an average grip strength between 1 and 30 mm Hg. The modal category for the average grip strength for the right hand was between 11 and 20 mm Hg constituting 36.7% (18 subjects) of the sample. The modal category for the average grip strength for the left hand was the same as for the right hand, constituting 32.7% (16 subjects) of the sample. In both cases, for the right and for the left hands, the first two categories between 1 and 20 mm Hg constitute about half the sample. (see Table 4)

TABLE 4

Average grip strengths of 49 arthritic women

|       |       | Right Hand |       | Left Hand |       |
|-------|-------|------------|-------|-----------|-------|
| mm Hg |       | Frequency  | %     | Frequency | %     |
| Low   | 1-10  | 7          | 14.3  | 8         | 16.3  |
|       | 11-20 | 18         | 36.7  | 16        | 32.7  |
|       | 21-30 | 9          | 18.4  | 12        | 24.5  |
|       | 31-40 | 9          | 18.4  | 6         | 12.2  |
|       | 41-50 | 2          | 4.1   | 4         | 8.2   |
|       | 51-60 | 2          | 4.1   | 1         | 2.0   |
| High  | 61+   | 2          | 4.1   | 2         | 4.1   |
| Total |       | 49         | 100.0 | 49        | 100.0 |

Hand dexterity will be viewed according to the percentile classification as found in the Sister Kenny Institute Publication on Hand Strength and Dexterity Tests (15). The norms established in this technical manual reflect both hand strength and dexterity results based on a non-handicapped population. For the female population, norms were established for the nine-hole peg test based on the results of testing 122 females who ranged in age from 18 to 89 years. The authors of this publication stated that although the sample was not a random one, it was stratified

in both age and sex to represent the entire adult population. Kellor, et al. also demonstrated from the results that the relationship between age and dexterity is a linear one (that is, the youngest being the most dexterous and the oldest being the least dexterous). (15:82)

For the nine-hole peg test, separate recordings for the right and left hands were made. In the case of a left handed (preferred) subject in this study, the percentile score value used was that for the right hand; in other words, the score for the preferred hand was synonymous with the score value for the right hand as indicated in the norm chart (see Appendix K).

Of the fifty women tested for this study, the majority of the dexterity readings fell into the first percentile group. The modal category for the right hand (PERR) was in the 10th percentile comprising 72% of the sample (36 subjects). The modal category for the left hand (PERL) was also in the first percentile group which constituted 60% of the sample (30 subjects). (see Table 5)

TABLE 5

Hand dexterity scores based on percentile norms

| Percentile Level | Right Hand |       | Left Hand |       |
|------------------|------------|-------|-----------|-------|
|                  | Frequency  | %     | Frequency | %     |
| Low 10th         | 36         | 72.0  | 30        | 60.0  |
| 25th             | 7          | 14.0  | 8         | 16.0  |
| 50th             | 4          | 8.0   | 10        | 20.0  |
| 75th             | 2          | 4.0   | 2         | 4.0   |
| High 90th        | 1          | 2.0   | 0         | 0     |
| Total            | 50         | 100.0 | 50        | 100.0 |

The differences in scores between PERR and PERL might be attributed to the normal difference of ability between right and left (preferred and less preferred) hands. One also might speculate that because there is less mobility in arthritic hands the importance of using both hands for performing various tasks may in fact encourage the greater use of the less preferred hand and consequently produce a slightly better dexterity score for the left hand when compared to norm values, especially at the fiftieth percentile level.

#### 4.5 MANIPULATIVE ABILITY

The manipulative ability of the fifty arthritic women in relation to the clothing fasteners tested will be viewed firstly according to their perceived handling difficulty of each fastener, and secondly, according to their performance level in manipulating each fastener type both in terms of alignment difficulty and completion level when closing.

To ascertain their perceived handling ease, the subjects were asked 'In terms of handling ease, please rank each type of clothing fastener according to difficulty on a scale of 1 to 5 (1 indicating the easiest; and 5 indicating the hardest).'

Overall, the modal category for the perceived handling ease for buttons was rank '5' which constitutes 46% (23 subjects) of the sample. Of the fifty responses, 66% (33 subjects) ranked the buttons as either the hardest to handle (rank '5') or next to being the hardest to handle (rank '4'). (see Table 6)

Of the fifty respondents, 44% (22 subjects) considered the zipper the easiest to handle (rank '1') while only 8% (4 subjects) perceived the

TABLE 6

Perceived Rankings in terms of handling ease

| Rankings: Handling Ease |             |             |             |             |             |
|-------------------------|-------------|-------------|-------------|-------------|-------------|
|                         | Easiest     |             |             | Hardest     |             |
|                         | 1           | 2           | 3           | 4           | 5           |
| Velcro                  | 26<br>(52%) | 17<br>(34%) | 6<br>(12%)  | 1<br>(2%)   | 0<br>(0%)   |
| Zipper                  | 22<br>(44%) | 17<br>(34%) | 5<br>(10%)  | 2<br>(4%)   | 4<br>(8%)   |
| Snaps                   | 3<br>(6%)   | 6<br>(12%)  | 11<br>(22%) | 9<br>(18%)  | 21<br>(42%) |
| Buttons                 | 2<br>(4%)   | 2<br>(4%)   | 13<br>(26%) | 10<br>(20%) | 23<br>(46%) |

Total N=50

zipper as being the hardest to handle (rank '5'). In total, 78% (39 respondents) perceived the zipper as either being the easiest (rank '1') or next to being the easiest (rank '2'). (see Table 6)

Overall, the modal category for the Velcro was rank '1' comprising 52% (26 subjects) of the sample. No one gave Velcro a rank score of '5' although one respondent did feel that Velcro was next to being the hardest to handle (rank '4'). In total, 86% (43 subjects) of the sample ranked Velcro as either being the easiest (rank '1') or next to being the easiest to handle (rank '2'). (see Table 6)

Of the fifty subjects, 42% (21 subjects) ranked the snaps as being the hardest to handle (modal category). Of the total respondents, 60% (30 subjects) felt the snaps were the hardest to handle (rank '5') or next to being the hardest to handle (rank '4'). (see Table 6)

The subjects were also asked 'In terms of handling ease, which clothing fastener did you find the hardest to handle? ... the easiest to handle?' A summary of the responses to this question is found in Table 7. In addition, the responses to this question related well with the modal category responses found in Table 6 regarding the ranking of each fastener's handling ease.

TABLE 7  
Perceived Handling Ease

|         | Hardest     | Easiest     |
|---------|-------------|-------------|
| Velcro  | 1<br>(2%)   | 26<br>(52%) |
| Zipper  | 4<br>(8%)   | 22<br>(44%) |
| Snaps   | 21<br>(42%) | 1<br>(2%)   |
| Buttons | 24<br>(48%) | 1<br>(2%)   |

The second aspect of manipulative ability of the fifty arthritic women is reflected in their performance while closing each type of clothing fastener. This performance may be viewed in terms of the completion level and the degree of alignment difficulty when fastening each type of fastener.

For this study, completion level simply refers to the number of fasteners that were completely fastened during the testing of the buttons, Velcro and snaps. In the case of the zipper, the completion level of the respondents was categorized as being either 'incapable' or as 'complete'. (see Table 8)

TABLE 8

Level of Completion during fastener closing

|         | One       | Two       | Three     | All          | Incapable  |
|---------|-----------|-----------|-----------|--------------|------------|
| Velcro  | 0<br>(0%) | 0<br>(0%) | 0<br>(0%) | 50<br>(100%) | 0<br>(0%)  |
| Zipper  | 0<br>(0%) | 0<br>(0%) | 0<br>(0%) | 50<br>(100%) | 0<br>(0%)  |
| Buttons | 0<br>(0%) | 3<br>(6%) | 1<br>(2%) | 44<br>(88%)  | 2<br>(4%)  |
| Snap    | 2<br>(4%) | 1<br>(2%) | 1<br>(2%) | 40<br>(80%)  | 6<br>(12%) |

All of the fifty subjects were able to close the Velcro and the zipper fasteners completely. Partial completion was in evidence in the button and snap fasteners; 44 (88%) of the subjects were able to close the button fasteners and 40 (80%) were able to close the snap fasteners completely. The last category (incapable) in Table 8 indicates the inability of the subject to fasten that particular fastener type.

In the context of this study, alignment difficulty refers to the degree of difficulty that the subjects experience while fastening the buttons, zipper, Velcro, and snaps. This was a subjective measure observed by the investigator while the subjects were manipulating the fasteners during closing. The performance of the subjects who were able to successfully close each fastener type was measured in the terms 'none', 'slight', or 'considerable' alignment difficulty (see Table 9).

All the fasteners tested in this study possess different alignment difficulties. The buttons, for example, must be poked through a button-hole to be completely fastened; the separating zipper must be accurately

TABLE 9

## Alignment difficulty in closing the fasteners

|                 | None          | Slight      | Considerable |
|-----------------|---------------|-------------|--------------|
| Buttons<br>N=44 | 42<br>(95.5%) | 2<br>(4.5%) | 0<br>(0%)    |
| Snap<br>N=40    | 36<br>(90%)   | 3<br>(7.3%) | 1<br>(2.4%)  |
| Zipper<br>N=50  | 39<br>(78%)   | 5<br>(10%)  | 6<br>(12%)   |
| Velcro<br>N=50  | 29<br>(58%)   | 19<br>(38%) | 2<br>(4%)    |

secured at the bottom before closing can be completed; and the snaps must be properly aligned so that the ball portion of the snap fits exactly into the socket portion. Each of the above fasteners can be viewed as 'precision fitting' fasteners. Velcro, on the other hand, requires less precision in fitting in that there is a greater freedom in the closing area on the surfaces of each Velcro component. Proper alignment of the Velcro (i.e. direct placement on top of each other) will ensure maximum strength whereas improper alignment can reduce the efficiency of the Velcro's holding power. In terms of the data results, the subjects appear to have a greater degree of alignment difficulty with the Velcro, with 'slight' category constituting some 38% of the subjects. With the zipper, the subjects have some difficulty in both the 'slight' category (10%) and the 'considerable' category (12%). One could assume that in the case of the separating zipper, the difficulty arises during the placement of the bottom stop into the slider and not during the actual zipping process.

#### 4.6 PREFERENCE

'Preference' in the context of this study will refer to the perceived rankings of fastener attractiveness and will also refer to the perceived acceptability of these fasteners in front closure style garments.

In terms of perceived fastener attractiveness, the subjects were asked 'In terms of appearance, rank each type of clothing fastener according to preference on a scale of 1 to 5' (where '1' would indicate the most preferred, and '5' the least preferred). (see Table 10)

TABLE 10

Perceived rankings in terms of attractiveness

| Rankings:    Attractiveness |                |             |             |                 |             |
|-----------------------------|----------------|-------------|-------------|-----------------|-------------|
|                             | Most Preferred |             |             | Least Preferred |             |
|                             | 1              | 2           | 3           | 4               | 5           |
| Buttons                     | 19<br>(38%)    | 12<br>(24%) | 12<br>(24%) | 3<br>(6%)       | 4<br>(8%)   |
| Zipper                      | 17<br>(34%)    | 16<br>(32%) | 8<br>(16%)  | 3<br>(6%)       | 4<br>(8%)   |
| Velcro                      | 13<br>(26%)    | 13<br>(26%) | 15<br>(30%) | 5<br>(10%)      | 4<br>(8%)   |
| Snaps                       | 4<br>(8%)      | 6<br>(12%)  | 9<br>(18%)  | 9<br>(18%)      | 22<br>(44%) |

Total N=50

Overall, the modal category for ranking the buttons in terms of attractiveness was rank '1' which constituted 38% (19 subjects) of the sample. The rank categories of '2' and '3' had an equal number of re-

sponses, each containing 24% (12 subjects) of the sample. In total, 62% (31 subjects) of the sample ranked buttons as either being the most attractive (rank '1') or next to being the most attractive (rank '2').

When the zipper was ranked in terms of attractiveness, 34% (17 subjects) of the sample gave the zipper a rank score of '1' (modal category). In total, 66% (33 subjects) of the sample ranked the zipper as either being the most attractive (rank '1') or next to being the most attractive fastener (rank '2').

In terms of ranking the attractiveness of the Velcro fastener, the modal category was the rank score of '3' which constituted 30% of the sample. The first and second ranks (most preferred and the next to being the most preferred in terms of attractiveness) had an equal number of responses, with each comprising 26% (13 subjects) of the sample.

Overall, for the ranking of attractiveness of the snaps, the modal category was rank '5' which constituted 44% (22 subjects) of the sample. The rank categories of '3' and '4' had an equal number of responses, each containing 18% (9 subjects) of the sample. In total, 62% (31 subjects) of the sample either ranked snaps as being the least attractive (rank '5') or next to being the least attractive (rank '4').

Also in terms of perceived fastener attractiveness, each subject was asked 'In terms of appearance, which clothing fastener do you find "looks the best"? ... "looks the least attractive"?' A summary of the responses for the sample is found in Table 11.

For the variables pertaining to the perceived acceptability of fasteners in front closure styled garments, each subject was asked 'In your opinion, would you wear buttons as a clothing fastener in a blouse with

TABLE 11  
Perceived Attractiveness

|         | Most        | Least       |
|---------|-------------|-------------|
| Buttons | 23<br>(46%) | 5<br>(10%)  |
| Zipper  | 15<br>(30%) | 14<br>(28%) |
| Velcro  | 9<br>(18%)  | 6<br>(12%)  |
| Snaps   | 3<br>(6%)   | 25<br>(50%) |

a front closure?' The question was repeated for the zipper, Velcro, and snap fasteners. The question was then rephrased to cover each of the other types of garment style: vest, jacket, dress, and coat. The responses were recorded in a 'yes', 'maybe' or 'no' format.

For the blouse, the buttons were the most favoured fastener in terms of 'yes' responses comprising 88% (44 subjects) of the sample. Half of the sample (25 subjects) viewed the Velcro as being acceptable in a blouse while slightly fewer responded in this category for the zipper (21 subjects). The snaps were the least favoured overall for acceptability in a blouse. (see Table 12)

A similar pattern of responses was recorded when the same questions were asked regarding vests. The majority of the sample favoured the buttons (45 subjects or 90%), followed by the responses for the Velcro (54%) and the zipper (48%). Once again, the snaps were the least favoured fastener (62% responding negatively to the question). (see Table 13)

TABLE 12

## Perceived acceptability of clothing fasteners in a blouse

|         | Responses   |             |             |
|---------|-------------|-------------|-------------|
|         | 'Yes'       | 'Maybe'     | 'No'        |
| Buttons | 44<br>(88%) | 3<br>(6%)   | 3<br>(6%)   |
| Velcro  | 25<br>(50%) | 8<br>(16%)  | 17<br>(34%) |
| Zipper  | 21<br>(42%) | 11<br>(22%) | 18<br>(36%) |
| Snaps   | 13<br>(26%) | 6<br>(12%)  | 31<br>(62%) |

Total N=50

TABLE 13

## Perceived acceptability of clothing fasteners in a vest

|         | Responses   |             |             |
|---------|-------------|-------------|-------------|
|         | 'Yes'       | 'Maybe'     | 'No'        |
| Buttons | 45<br>(90%) | 1<br>(2%)   | 4<br>(8%)   |
| Velcro  | 27<br>(54%) | 6<br>(12%)  | 17<br>(34%) |
| Zipper  | 24<br>(48%) | 13<br>(26%) | 13<br>(26%) |
| Snaps   | 19<br>(38%) | 0<br>(0%)   | 31<br>(62%) |

Total N=50

For the perceived acceptability of the clothing fasteners in a jacket

with a front closure, the buttons remained as the most favoured within the sample (42 subjects or 84%). The zipper was viewed more favourably than the Velcro; that is, 54% (27 subjects) of the sample responded positively to the zipper, while 44% (22 subjects) of the sample responded negatively to the use of Velcro. The snaps continued to be the least favoured of all the fasteners, as 72% (36 subjects) of the sample responded negatively to the use of snaps in a jacket with a front closure. (see Table 14)

TABLE 14

Perceived acceptability of clothing fasteners in a jacket

|         | Responses   |             |             |
|---------|-------------|-------------|-------------|
|         | 'Yes'       | 'Maybe'     | 'No'        |
| Buttons | 42<br>(84%) | 2<br>(4%)   | 6<br>(12%)  |
| Zipper  | 27<br>(54%) | 5<br>(10%)  | 18<br>(36%) |
| Velcro  | 18<br>(36%) | 10<br>(20%) | 22<br>(44%) |
| Snaps   | 12<br>(24%) | 2<br>(4%)   | 36<br>(72%) |

Total N=50

In the responses for the dress, the acceptability of the buttons was not as strong (35 subjects or 71.4% of the sample) as with the blouse, vest, or jacket. The zipper was the next favoured fastener in terms of acceptability in a dress with 69.4% (34 subjects) of the sample re-

sponding positively, while the responses for the Velcro followed with 55.1% (27 subjects) of the sample. Again, the snaps were the least favoured of all the fastener types (33 subjects or 67.3% responding negatively). (see Table 15)

TABLE 15

Perceived acceptability of clothing fasteners in dress

|         | Responses     |              |               |
|---------|---------------|--------------|---------------|
|         | 'Yes'         | 'Maybe'      | 'No'          |
| Buttons | 35<br>(71.4%) | 2<br>(4.1%)  | 12<br>(24.5%) |
| Zipper  | 34<br>(69.4%) | 5<br>(10.2%) | 10<br>(20.4%) |
| Velcro  | 27<br>(55.1%) | 4<br>(8.2%)  | 18<br>(36.7%) |
| Snaps   | 10<br>(20.4%) | 6<br>(12.2%) | 33<br>(67.3%) |

Total N=49

For the acceptability of fasteners in a front closure style coat, the buttons were most preferred, drawing a positive response from 90% (45 subjects) of the sample, followed by the 'yes' responses for the zipper (23 subjects or 46%) and for the Velcro (18 subjects or 36%). Lastly, 78% (39 subjects) of the sample responded negatively to the use of snaps in a coat. (see Table 16)

The next section will attempt to analyze the raw data that has been presented here in a manner which will allow us to accept or reject each of the study's hypotheses.

TABLE 16

Perceived acceptability of clothing fasteners in a coat

|         | Responses   |            |             |
|---------|-------------|------------|-------------|
|         | 'Yes'       | 'Maybe'    | 'No'        |
| Buttons | 45<br>(90%) | 2<br>(4%)  | 3<br>(6%)   |
| Zipper  | 23<br>(46%) | 5<br>(10%) | 22<br>(44%) |
| Velcro  | 18<br>(36%) | 8<br>(16%) | 24<br>(48%) |
| Snaps   | 7<br>(14%)  | 4<br>(8%)  | 39<br>(78%) |

Total N=50

4.7 HYPOTHESIS 1. (STATED IN THE NULL FORM)

There is no relationship between hand dysfunction (as determined by grip strength and hand dexterity) and the ability of the arthritic women to manipulate the four different types of clothing fasteners.

4.7.1 Crosstabulations:

To test this hypothesis, the crosstabulations to be examined are those involving the variables pertaining to hand ability (as determined by grip strength and hand dexterity) and manipulative ability (as determined by perceived handling ease, level of completion during fastening, and alignment difficulty for each type of clothing fastener). Each crosstabulation will be discussed separately.

Average grip strength (right and left hands) by the perceived rankings of the buttons, zipper, Velcro, and snaps in terms of handling ease. (see Table 17)

The overall modal category for the grip strength (right and left hands) was the second one (11-20 mm Hg); modal category for the buttons and the snaps in terms of handling ease was rank '5' (hardest); for the zipper and the Velcro, handling ease was rank '1' (easiest).

TABLE 17

Average grip strength (GS) by Handling ease (HE)

|                         | Buttons | Zipper                | Velcro | Snaps |
|-------------------------|---------|-----------------------|--------|-------|
| Symmetric Lambda Values |         |                       |        |       |
| Average Grip Strength   |         |                       |        |       |
| Right Hand              | -       | -                     | -      | -     |
| Left Hand               | -       | 0.18333*<br>(-GS/+HE) | -      | -     |

\* Lambda value meets the minimum requirements set by this study for hypothesis testing (0.15)

- Lambda value does not meet the minimum requirements set by this study.

-GS (low grip strength)                      -HE (low handling ease)

+GS (high grip strength)                      +HE (high handling ease)

The symmetric lambda values for these crosstabulation ranged from 0.05172 to 0.10169 for the right hand; and 0.08333 to 0.18333 for the left hand. Only in the case of the crosstabulation between grip strength for the left hand and the perceived handling ease for the zipper was the lambda value greater than 0.15 or 15% (i.e., 0.18333 or

18.3%). Since this was the only case, one might speculate that this lambda value may just reflect the normal differences associated with the left (or less preferred) hand. (see Appendix L)

The symmetric lambda values which indicate the measure of association between the variables of grip strength and perceived handling ease are not strong ones. This may be largely attributed to the negatively skewed distribution of the grip strength scores for both the right and left hands. The average grip strength for the majority of the sample was between 1 and 30 mm Hg.

Hand dexterity, based on percentile norms (right and left hands) by the perceived rankings of the buttons, zipper, Velcro, and snaps in terms of handling ease.

The overall modal category for hand dexterity based on percentile norms was at the 10th percentile level; modal categories for the zipper and Velcro were both rank '1'; and for the buttons and snaps, rank '5'. (see table 5)

The symmetric lambda values ranged from 0.02439 to 0.13158 for the right hand; and for the left hand, 0.0 to 0.12245. Again, the symmetric lambda values indicate that there is not a strong measure of association between hand dexterity and the perceived handling ease of the clothing fasteners. The low lambda values can be attributed to the skewed distribution of the dexterity scores within the sample; for example, the majority of the scores for both the right and left (preferred and less preferred) hands are in the 10th percentile group.

Overall, the symmetric lambda values do not clearly substantiate an association between hand dysfunction (as determined by grip strength and

hand dexterity) and manipulative hand ability (as determined by the perceived rankings of the fasteners in terms of handling ease). Although there is some association between these variables, the measure of association is not a strong one, primarily due to the concentration of scores towards one end of the scale, or towards low dexterity scores and low grip strength readings.

Average grip strength (right and left hands) by the level of completion (and alignment difficulty) for each of the fasteners.

As mentioned above, the majority of the sample had low grip strength readings. In terms of completion level, all of the subjects were able to manipulate (open and close) the zipper and Velcro fasteners, while 88% were able to fasten all of the buttons and 80% the snap fasteners. Because of these modal frequencies, the symmetric lambda values for the above crosstabulations were low (i.e. between 0.0 and 0.13208).

Hand dexterity, based on percentile norms (right and left hands) by the level of completion (and alignment difficulty) for each of the fasteners.

Since the majority of the sample had very low dexterity scores (i.e. within the 10th percentile) and most were able to successfully manipulate each of the fastener types, the symmetric lambda values were consequently very low (i.e. between 0.0 and 0.05882).

Based on the findings of this sample, the first hypothesis can neither be accepted or rejected due to the relatively low strength of the symmetrical lambda values. Although there is some measure of association, the relationship between hand ability and manipulative ability is not clearly delineated.

#### 4.8 HYPOTHESIS 2. (STATED IN THE NULL FORM)

There is no relationship between their preference ranking for these fasteners and their ability to manipulate them.

##### 4.8.1 Crosstabulations:

To test this hypothesis, the crosstabulations needed are those involving fastener preference (as determined by the perceived rankings of fastener attractiveness, and by acceptability of the fasteners in front closure style garments) and manipulative ability (as determined by perceived handling ease of the fasteners). Each crosstabulation will be discussed separately.

The perceived rankings of the buttons, zipper, Velcro, and snaps in terms of handling ease by the perceived rankings of the buttons, zipper, Velcro, and snaps in terms of attractiveness.

The modal category for the buttons and the snaps in terms of handling ease was rank '5' (hardest); for the zipper and the Velcro, the handling ease was rank '1' (easiest). In terms of attractiveness rankings for the buttons and the zipper the modal category was rank '1'; for the Velcro the modal category was rank '3'; and for the snaps, rank '5'.

The symmetric lambda values ranged from 0.03448 to 0.15789 (see Table 18). Although there was some measure of association between these two variables, this measure was not a strong one. Only in the case of the crosstabulation between handling ease and attractiveness ranking for the snap fasteners does the symmetric lambda become greater than 0.15 or a 15% improvement in one's ability to predict. (see Appendix L)

TABLE 18

## Handling Ease (HE) by Attractiveness (AT)

## Symmetric Lambda Values

|         |                       |
|---------|-----------------------|
| Buttons | -                     |
| Zipper  | -                     |
| Velcro  | -                     |
| Snaps   | 0.15789*<br>(-HE/-AT) |

\* Lambda value meets the minimum requirements set by this study for hypothesis testing (0.15)

- Lambda value does not meet the minimum requirements set by this study.

-HE (low handling ease)      -AT (low attractiveness ranking)

+HE (high handling ease)      +AT (high attractiveness ranking)

The perceived rankings of the buttons, zipper, Velcro, and snaps in terms of handling ease by the perceived acceptability of buttons, zipper, Velcro, and snaps in front closure style garments.

Overall, the buttons were the most favoured clothing fastener in all of the garment types, and the snaps were the least favoured. The acceptability of the Velcro and the zipper fasteners varied among the different garment styles. Generally the zipper was more preferred in the jacket, dress, and in the coat while the Velcro fastener was more preferred in the blouse and in the vest in terms of frequency responses for the 'yes' answer.

The measure of association as expressed by the symmetric lambda values varied for each type of fastener. For example, the lambda value

ranged from 0.0 to 0.09375 for the buttons; 0.03409 to 0.10909 for the zipper; 0.0 to 0.15217 for the Velcro; and 0.05000 to 0.035417 for the snaps. The differences in lambda values for each of the fastener types can be attributed to the differences in perceived acceptability for the fasteners in the different types of garments, since the handling ease for each of the fasteners remains constant. In the case of the crosstab between Velcro (in terms of handling ease) and the perceived acceptability of the Velcro in a dress (with a front closure), there is a 15.2% (0.15217) improvement in the overall prediction between these two variables. For the snaps, the highest lambda (above 0.15) is for the crosstab between handling ease of the snaps and the perceived acceptability in a vest (0.35417), followed by the perceived acceptability in a blouse (0.25000), perceived acceptability in a jacket (0.16279), and lastly by the perceived acceptability in a dress (0.15556). There is a relatively good measure of association between snap fasteners in terms of handling ease and acceptability in a vest, blouse, jacket, and dress (in order of magnitude); that is, snaps ranked '5' (hardest) in terms of handling ease, and were also the least favoured fastener in garment use (see Table 19). Buttons were also ranked '5' (hardest) in terms of handling ease, but were highly favoured for use in all garments. Both Velcro and the zipper were ranked as '1' (easiest to handle), and both received varied rankings in terms of acceptability. (see Appendix L)

Therefore, in terms of the second hypothesis, there appears to be a relationship between the perceived handling ease of the clothing fasteners and the perceived acceptability of these fasteners when used in front closure style garments. This association is substantiated by the

TABLE 19

Handling Ease (HE) by Acceptability in Garments (AC)

|                         | Blouse                | Vest                  | Jacket                | Dress                 | Coat |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------|
| Symmetric Lambda Values |                       |                       |                       |                       |      |
| Buttons                 | -                     | -                     | -                     | -                     | -    |
| Zipper                  | -                     | -                     | -                     | -                     | -    |
| Velcro                  | -                     | -                     | -                     | 0.15217*<br>(+HE/+AC) | -    |
| Snaps                   | 0.25000*<br>(-HE/-AC) | 0.35417*<br>(-HE/-AC) | 0.16279*<br>(-HE/-AC) | 0.15556*<br>(-HE/-AC) | -    |

\* Lambda value meets the minimum requirements set by this study for hypothesis testing (0.15).

- Lambda value does not meet the minimum requirements set by this study.

-HE (low handling ease)                      -AC (low acceptability)

+HE (high handling ease)                      +AC (high acceptability)

relative strengths of the symmetric lambda values for the following: Velcro when used in a dress; and snaps when used in a blouse, vest, jacket, or dress. The only measure of association that was stronger than 15% for the perceived attractiveness of the fasteners was in the case of the snap fasteners, where the lambda was 0.15789 (15.8% improvement).

#### 4.9 HYPOTHESIS 3. (STATED IN THE NULL FORM)

There is no relationship between their preference ranking for these fasteners and their perceived acceptability of the fasteners when used in front closure style garments.

##### 4.9.1 Crosstabulations:

To test this hypothesis, the crosstabulations needed are those involving perceived rankings of the fasteners in terms of attractiveness and the perceived acceptability of the fasteners when used in front closure style garments.

The perceived rankings of the buttons, zipper, Velcro and snaps in terms of attractiveness by the perceived acceptability of buttons, zipper, Velcro, and snaps in front closure style garments.

Overall, the modal category in terms of attractiveness ranking for the buttons and the zipper was rank '1' (most preferred); for the Velcro, rank '3'; and for the snaps, rank '5' (least preferred). In terms of overall fastener acceptability, buttons were found to be the most acceptable clothing fastener for each of the garment styles. The snaps were the least favoured and the zipper and the Velcro fasteners were in between. For the blouse and vest, the Velcro had a higher percentage of acceptability than the zipper; yet for the jacket, dress, and coat the zipper was higher.

The symmetric lambda values varied within each fastener type category. For the buttons, the lambda values ranged from 0.02778 to 0.015909; for the zipper, 0.07143 to 0.20968; for the Velcro, 0.10345 to 0.21667; and for the snaps, 0.07692 to 0.17021 (see Table 20). Since the measure

of fastener attractiveness remains the same for each of the clothing fasteners, the differences in the lambda values can be attributed to the differences in the perceived acceptability of each fastener type in a blouse, vest, jacket, dress, and coat.

TABLE 20

Attractiveness (AT) by Acceptability in Garments (AC)

|                         | Blouse                | Vest                  | Jacket                | Dress                 | Coat                  |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Symmetric Lambda Values |                       |                       |                       |                       |                       |
| Buttons                 | -                     | -                     | -                     | 0.15909*<br>(+AT/+AC) | -                     |
| Zipper                  | 0.20968*<br>(+AT/+AC) | 0.15254*<br>(+AT/+AC) | -                     | -                     | 0.16667*<br>(+AT/+AC) |
| Velcro                  | 0.21667*<br>(+AT/+AC) | -                     | 0.15873*<br>(+AT/+AC) | 0.19643*<br>(+AT/+AC) | -                     |
| Snaps                   | 0.17021*<br>(-AT/-AC) | -                     | -                     | -                     | -                     |

\* Lambda value meets the minimum requirements set by this study for hypothesis testing (0.15).

- Lambda value does not meet the minimum requirements set by this study.

-AT (low attractiveness ranking)      -AC (low acceptability)

+AT (high attractiveness ranking)      +AC (high acceptability)

In terms of the third hypothesis, there seems to be a relationship between fastener attractiveness and the perceived acceptability of the fasteners in front closure style garments. This is substantiated by the lambda values which are greater than 0.15 or 15% as in the case of the

perceived attractiveness rankings of the buttons by the acceptability of buttons in a dress (0.15909); the zipper in a blouse (0.20968); zipper in a vest (0.15254); zipper in a coat (0.16667); Velcro in a blouse (0.21667); Velcro in a jacket (0.15873); and snaps in a blouse (0.17021). (see Appendix L)

#### 4.10 HYPOTHESIS 4. AND 5. (STATED IN THE NULL FORM)

The perceived acceptability of each clothing fastener when used in front closure style garments is not related to fastener handling ease.

The perceived acceptability of each clothing fastener when used in front closure style garments is not related to fastener attractiveness.

##### 4.10.1 Crosstabulations:

To test both of these hypotheses, the crosstabulations needed are those involving fastener attractiveness, fastener handling ease, and the perceived acceptability of fasteners in front closure style garments.

The perceived rankings of the buttons, zipper, Velcro, and snaps in terms of handling ease by the perceived rankings of the buttons, zipper, Velcro, and snaps in terms of attractiveness by the perceived acceptability of the buttons, zipper, Velcro, and snaps in front closure style garments.

In testing these hypotheses, the assumption is made that an 'ideal' fastener for a disabled person would be easy to manipulate and attractive in appearance, and that this would result in its preferred use in various types of garment styles.

For these crosstabulations, only those which had 10 or more responses in either the 'yes', 'maybe', or 'no' category and which had a symmetric

lambda value of 0.15 or greater will be discussed in terms of accepting or rejecting the fourth hypothesis. Each series of responses will be discussed separately; that is, by 'yes' responses, 'maybe' responses, and 'no' responses.

#### 4.10.1.1 Fastener Acceptability - "Yes" Responses

The measure of association (as expressed by the symmetrical lambda coefficient values) between the handling ease rankings and the attractiveness rankings for buttons in the various front closure style garments ranges from 0.0 (vest) to 0.10870 (jacket) (see Table 21). The relatively low lambda values can be attributed to the skewed distribution of the handling ease and attractiveness rankings for the buttons. Overall, the majority of the subjects who responded favourably to the buttons in all the garment styles ranked the buttons as either being the hardest to handle or next to being the hardest to handle, and as either being the most preferred or next to being the most preferred in terms of attractiveness rankings.

For the zipper, the symmetric lambda values ranged from 0.0 (blouse) to 0.16667 (jacket). The measure of association between handling ease and attractiveness for each of the garment styles is relatively low. Only in the crosstabulation for the jacket did the lambda value exceed 15%. Generally, the majority of those respondents who ranked the zipper favourably for use in front closure style garments (see Tables 12 to 16) also ranked the zipper as either being the easiest to handle (rank '1') or next to being the easiest (rank '2'), while the majority of these respondents ranked the zipper in terms of attractiveness as either being

TABLE 21

## Handling Ease (HE) by Attractiveness (AT)

## 'YES' RESPONSES FOR ACCEPTABILITY IN GARMENTS (+AC)

|                         | Blouse                | Vest                  | Jacket                | Dress                 | Coat |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------|
| Symmetric Lambda Values |                       |                       |                       |                       |      |
| Buttons                 | -                     | -                     | -                     | -                     | -    |
| Zipper                  | -                     | -                     | 0.16667*<br>(+HE/+AT) | -                     | -    |
| Velcro                  | -                     | -                     | 0.21053*<br>(+HE/+AT) | -                     | -    |
| Snaps                   | 0.44444*<br>(+HE/+AT) | 0.42308*<br>(+HE/+AT) | 0.53333*<br>(+HE/+AT) | 0.46154*<br>(+HE/+AT) | -    |

\* Lambda value meets the minimum requirements set by this study for hypothesis testing (0.15); and with the number of respondents 10 or above.

- Lambda value does not meet the minimum requirements set by this study.

-HE (low handling ease)      -AT (low attractiveness ranking)

+HE (high handling ease)      +AT (high attractiveness ranking)

the most preferred (rank '1') or next to being the most preferred (rank '2').

The symmetric lambda values for the Velcro fastener ranged from 0.08000 (dress) to 0.21053 (jacket). There was some measure of association among the 'yes' respondents for the rank score of handling ease and rank scores for attractiveness. Only in the crosstabulation between handling ease and attractiveness rankings for the jacket was lambda greater than 15%. Overall, all those who responded positively to the

use of Velcro in front closure style garments (see Tables 12 to 16) ranked the Velcro as either being the easiest to handle (rank '1') or next to being the easiest to handle (rank '2').

Of all the fasteners, the least number of 'yes' responses in terms of fastener acceptability were recorded for the use of snap fasteners. Of those who responded positively to the use of snaps in various front closure style garments, the lambda values ranged from 0.44444 (blouse) to 0.55556 (coat) (see Table 21). A relatively good measure of association was evident between handling ease rankings and attractiveness rankings. Although the number of 'yes' respondents ranged from 14% to 38% (see Tables 12 to 16) for the acceptability of snaps in garment styles, the degree of acceptability increased as handling ease and attractiveness rankings increased. (see Appendix L)

#### 4.10.1.2 Fastener Acceptability - "Maybe" Responses

Because of the ambiguity surrounding the 'maybe' responses, (as they could be construed as being an indecisive response) a discussion of these responses in terms of measure of association will not be pursued since such discussion would be meaningless in the testing of the fourth and fifth hypotheses.

#### 4.10.1.3 Fastener Acceptability - "No" Responses

The number of subjects who responded negatively to the use of buttons in the various front closure style garments was small (6% to 12%) except for those who responded negatively to the use of buttons in a dress (24.5%) (See Tables 12 to 16). For the use of buttons in a dress, the

symmetric lambda was relatively low (0.09091) (see Table 22). This can be attributed to the fact that the majority of those who responded negatively to the use of buttons in a dress also ranked the buttons as the hardest to handle (rank '5').

TABLE 22

## Handling Ease (HE) by Attractiveness (AT)

## 'NO' RESPONSES FOR ACCEPTABILITY IN GARMENTS (-AC)

|                         | Blouse                | Vest                  | Jacket                | Dress                 | Coat                  |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Symmetric Lambda Values |                       |                       |                       |                       |                       |
| Buttons                 | -                     | -                     | -                     | -                     | -                     |
| Zipper                  | 0.34783*<br>(+HE/+AT) | -                     | 0.40000*<br>(+HE/+AT) | 0.21429*<br>(+HE/-AT) | -                     |
| Velcro                  | -                     | 0.15000*<br>(+HE/-AT) | 0.23077*<br>(+HE/-AT) | -                     | 0.17241*<br>(+HE/-AT) |
| Snaps                   | -                     | -                     | -                     | 0.17241*<br>(-HE/-AT) | -                     |

\* Lambda value meets the minimum requirements set by this study for hypothesis testing (0.15); and with the number of respondents 10 or above.

- Lambda value does not meet the minimum requirements set by this study.

-HE (low handling ease)                      -AT (low attractiveness ranking)

+HE (high handling ease)                      +AT (high attractiveness ranking)

The negative responses for the use of zippers in the various front style garments range from a low of 10 respondents for the dress (20.4%)

to 22 negative responses for the coat (44%) (see Tables 12 to 16). The symmetric lambda values for the zipper range from 0.03571 (coat) to 0.4000 (jacket) (see Table 22). The measure of association as expressed by the symmetric lambda values exceed 15% for the dress (0.21429), the blouse (0.34783) and for the jacket (0.40000). Although these measures of association were relatively good for the dress, blouse, and jacket use, those subjects who responded negatively to the use of zippers in these garments may have done so because they felt that the use of a zipper in such an application would be unattractive.

The number of subjects who responded negatively to the use of Velcro in the various front closure garments varied from 34% (blouse and vest) to 44% (coat) (see Tables 12 to 16). The symmetric lambda values range from 0.13043 (blouse and dress) to 0.23077 (coat) (see Table 22). There is some measure of association as expressed in the lambda values for the vest (0.15000), coat (0.17241), and jacket (0.23077). The attractiveness rankings of the Velcro shows more variation than the handling ease rankings for this fastener. On the whole, Velcro was perceived as either being the easiest or next to being the easiest to handle, while in terms of attractiveness, the Velcro was given a modal rank of 3 (a neutral position). One could speculate that the perceived attractiveness of the Velcro may be more influential in determining the negative responses of the subjects. It is also interesting to note the large number of subjects disliking the use of Velcro in a coat and jacket; some of the subjects in this study voiced their personal dislike for Velcro because they felt it might not be secure enough when closed, especially in an over garment such as a jacket or coat.

Overall, the snaps had the largest number of negative responses of all the fasteners in terms of acceptability in the various front closure styled garments. In all cases the majority of the subjects responded negatively to the use of the snaps; 62% (blouse and vest) to 78% (coat) (see Tables 12 to 16). The symmetric lambda values range from 0.04348 (vest) to 0.17241 (dress). The relatively low lambda values might be attributed to the distribution of both handling ease and attractiveness rankings for the snaps. In other words, the majority of the respondents ranked the snaps as being the hardest to handle (rank '5') and as being the least attractive (rank '5'). (see Appendix L)

In reviewing the 'yes', 'maybe', and 'no' responses, it is found that both the fastener handling ease and attractiveness rankings are influential in determining the subject's acceptability of the fasteners in the various garment styles. For the buttons, attractiveness is more influential than is handling ease for its acceptability as a fastener in the various garment styles. For the zipper and Velcro fasteners, the distinction is not quite as clear. There is definitely some measure of association between handling ease and attractiveness rankings for these fasteners, although attractiveness appears to be more influential in the negative responses. Overall, the snaps were perceived as being difficult to manipulate as well as being the least attractive. This is reflected in the large number of negative responses for the use of snaps in the various garment styles.

In summary, the subjects' perceived acceptability of each clothing fastener when used in front closure style garments is more strongly determined by fastener attractiveness than by fastener handling ease.

## Chapter V

### CONCLUDING REMARKS

#### 5.1 GENERAL CONCLUSIONS

Regardless of their age, sex, or physical ability, the handicapped must have the opportunity to choose clothing which is sensitive not only to their specific hygienic and functional needs, but also to their aesthetic ones; In other words, clothing for the handicapped must fulfill each of their physical, psychological, and social requirements. To achieve this end, their clothing style should be comparable in appearance to those worn by the non-handicapped population. For while the contributions that proper clothing designs make in easing the physical maintenance of the handicapped and the disabled are very important, the role of design in contributing to their psychological maintenance by enabling this group to present a 'normal' appearance should not be overlooked. Therefore, attractive and pleasing styling should not have to be sacrificed for the attainment of certain functional attributes.

The most prevalent problem in the ready-to-wear clothing market (which renders these clothes somewhat inappropriate for some forms of handicaps) is that for the most part, these clothes are designed around a set of 'standardized' body proportions. Handicapped individuals are not, as a group, standardized in body shape or proportion. As a result, mass producing clothing for the handicapped does not offer the best approach to the problem of producing clothing to meet the specific needs of the handicapped.

Suitable garment design is a most important factor in providing the disabled with clothing that reflects their individual needs. Clothing designs for the handicapped can be conceived as being an overall (or external) design problem whereby silhouette changes and garment features are subject to modifications. Another design approach is directed within the confines of the garment silhouette; this approach to garment design problem is an internal one. The latter approach to garment design for the disabled is perhaps a simpler and cheaper approach than the first one since it utilizes ready-made garments. The first design approach is actually that of custom design, as it involves major structural changes to a ready-made garment. Thus, this approach should prove to be more complicated and more costly to employ. By approaching the design problem internally, minor modifications to ready-made garments can be made while maintaining the 'conventional' appearance of the garment. The success of this last approach can only be achieved through careful selection of garments already possessing certain self-help features and a potential to be modified.

Therefore, it would seem that three approaches to clothing for the disabled should be considered. The first is to perform minor alterations on ready-to-wear garments that already have suitable design features (those promoting self-help) and meet certain priorities such as comfort and style. Such garments are more readily altered to provide for features such as alternative clothing fasteners to meet an individual's manual capabilities. The second approach to garment design for the handicapped is to make major alterations (including structural ones) to ready-made garments by incorporating features promoting greater wearing

ease and easy on/off characteristics, and by changing the location of the garment opening (for example, moving the zipper from the center back of the garment to the center front). The third approach to clothing for the disabled is perhaps the most satisfactory one in terms of achieving individual requirements, but is also the most expensive one. This approach requires custom design work, which limits the numbers of those who have the expertise necessary to pursue this approach. The other approaches to providing suitable clothing for the disabled (involving modifying ready-to-wear garments) can be accomplished with some degree of expert direction and advice, and require the least amount of time and equipment to achieve. In addition, some of the work involved in these approaches can be done by the disabled themselves.

## 5.2 SUMMARY OF FINDINGS

One of the aspects of clothing for the disabled which deserves special attention is the way in which they don and remove their clothing. As an activity of daily living, dressing places many stressful demands on the body - especially on those joints that are involved in the thrusting, pulling, and other maneuvers needed to dress. The hand and finger joints support much of the stress in holding and manipulating both the garments and the clothing fasteners when maneuvering clothing onto and off the body. Every type of clothing fastener requires different levels of hand ability in terms of strength, dexterity and co-ordination. Therefore, those persons with a hand dysfunction (experiencing limited functional hand ability) are at a disadvantage in terms of the process of dressing. It was with this problem in mind that this study was conceived and executed.

Basically, the purpose of this study was to determine whether persons with an arthritic hand dysfunction have any preference among four types of clothing fasteners (buttons, zipper, Velcro and snaps), and to what extent this preference (if it existed) was determined by their physical limitations in terms of their ability to manipulate these fasteners or by their perception of them in terms of 'acceptable' appearance. Specifically, this study attempted to find out whether handling ease or fastener attractiveness was more important in selection of garments; in other words, were these women's preferences among the fasteners influenced more strongly by their ability to give the wearer a 'conventional' appearance, or by their ease of manipulation.

This study tested fifty arthritic women who experienced some form of hand dysfunction due to either (or both) inflammatory or non-inflammatory form of joint disease. The majority of the women had either rheumatoid arthritis or rheumatoid arthritis in combination with another type of arthritis. Most of these women indicated that they had had arthritis for more than ten years. All of the women, except for one, were able to complete the testing procedures. One subject was unable to complete the grip strength test.

The final tabulation of the results revealed that the majority of the women had relatively low levels of manual grip strength and dexterity. It was apparent from the test results that their arthritic hand dysfunction was not only a visible one in terms of hand deformity but also an internal one in terms of loss of grip strength and reduced hand dexterity. Despite this, the responses of the women showed a clear trend indicating that a conventional appearance with respect to clothing fasteners

in front closure style garments was much more important in determining their preferences among the four clothing fasteners than their relative ease of manipulation. For example, the button fasteners were perceived by most as being not only the most difficult of all the fasteners to manipulate, but also as the most preferred in terms of attractiveness and the most accepted in front closure style garments. The snap fasteners, on the other hand, were perceived as being difficult to handle and also the least preferred fastener in terms of attractiveness and the least accepted in terms of use in front closure style garments. The responses for the zipper and Velcro fasteners varied, especially in their acceptance in front closure style garments. Although Velcro was perceived as being the easiest of all the fasteners to manipulate, it was viewed (relatively) to be less preferred in terms of attractiveness in comparison to the responses for the zipper. In terms of acceptability in front closure style garments, the Velcro was more preferred than the zipper for use in blouses and vests. The zipper was more acceptable in the jacket, dress, and coat styles than either the Velcro or snap fasteners. In summary, it appears that fastener attractiveness was more influential in determining the acceptability of these fasteners in front closure styles than was the fastener handling ease. This supports the philosophy that clothing for the handicapped should be comparable in appearance to those of the non-handicapped. Therefore, the challenge for designers of clothing for the handicapped is to strive for 'conventional' appearances of garments and at the same time incorporate self-help features in the garments which make them easier to use and maintain.

For the present, it is suggested that clothing for the disabled needs to be chosen on the basis of their potential to be altered to suit an individual's clothing requirements. The following are some of the recommendations for selecting and modifying clothing for the disabled:

1. Buttons will be the most preferred fastener in terms of appearance, even if they pose difficulties during manipulation. Therefore, every attempt should be made to preserve a conventional appearance by altering the fastening technique; for example, by using Velcro or zipper fasteners in a mock button closure.
2. Further modify the present clothing fasteners for easier use. This can be achieved by adding a ribbon or a ring to the zipper tab in order to increase the grasping area; or, if a separating zipper poses difficulties, use a regular, non-separating one; change the style of the buttons to those with a raised rim and those with a shank (either a plastic or a thread one) for easier grasping; adjust the buttonholes so that the button can be easily slipped through and still not be too loose; use elastic thread in buttoned cuffs so that unbuttoning is unnecessary; use elastic thread when sewing on buttons; when using Velcro, have some form of decorative ornament or button on the outside of the garment to aid in the proper alignment of the Velcro fastener.
3. Place all fasteners within easy reach and sight, especially those fasteners which may pose alignment difficulties.

4. Choose garments so that less attractive but functional clothing fasteners such as Velcro and zippers can be easily incorporated into the garment (for example, garment design may offer the option of concealing the fastener under a placket opening or a pleat).
5. Avoid using snaps or any other type of fastener that requires 'normal' strength in the thumb to press the fastener closed, and 'normal' dexterity and strength to pry the fastener opened. This is especially true if the person has lost strength or power in the thumb or forefinger.
6. Further research in clothing for the disabled needs to be directed towards the process of dressing and how garment design features are related to this process. This aspect of clothing needs to be considered as a priority in garment selection.

In summary, the greatest potential for providing suitable clothing for the handicapped is in the area of selecting and modifying ready-made garments. The challenge, therefore, is to create clothing that is comparable in styling to that being worn by the non-handicapped population while maintaining certain functional and hygienic attributes necessary for the wearing comfort of the handicapped. In essence, these garments need to be conventional in appearance and yet function in a non-conventional manner during the dressing process.

Further research needs to be directed in the area of testing such garments. If this study were to be carried on to the next logical step, it would involve the use of more sophisticated garment mock-ups incorpo-

rating various features of design, materials, and fastener types in order to investigate the dressing difficulties resulting from upper body and limb movement limitations and hand dysfunctions. As suggested above, this would involve the use of actual 'ready-to-wear' garments altered in ways which would test the ability of such clothing to achieve specific functional and aesthetic goals. Testing would be designed in a way which would relate 'classes' of various disabilities (i.e. hand dysfunction, motion restriction, and so on) to those combinations of design features which would offer the greatest improvement in terms of 'self-help' and 'psychological maintenance'. Hopefully, we will see the results of such research in the near future. It is hoped that this study and those referred to in the cited references will point out the need for more research in the area of clothing for specific effects of various disabling conditions; it is also hoped that they will provide a sound and useful basis for future research. In the meantime, however, the guidelines provided offer sufficient information for useful steps to be taken. It is hoped that the opportunity and the challenge will not be ignored.

# CITED REFERENCES

1. Ahrbeck, Ellen Hanselmann and Shirley E. Friend. "Clothing - An Asset or Liability? Designing for Special Needs." Rehabilitation Literature, 37 (October 1976): 295-296.
2. Baer, Margaret, Merry Jo Dallas, and Louise White. "Clothing Needs of Women with Arthritis." Fort Collins, Colorado: Colorado State University, May 1977. (mimeograph)
3. Blair, Alice Ruth. "Instructional Guide for Cerebral Palsied Children: Clothing Fasteners Related to Articulation of Upper Extremities." Master's Thesis, Florida State University, Tallahassee, Florida, 1975.
4. Broome, Charlotte, "Fashions for the Physically Handicapped Woman." The Canadian Nurse. 71 (November 1975): 18-22.
5. Brown, Mary Eleanor. "Self-Help Clothing." Orthotics, Etcetera. Sidney Licht, M.D. (editor). New Haven: Elizabeth Licht Publisher, 1966: 601-645.
6. Caillet, Rene. Hand Pain and Impairment. Philadelphia: F.A. Davis Company, 1971.
7. Canadian Government Specifications Board. Canada Standard System for Sizing Women's Apparel: CAN2-49.201-M78.
8. Cookman, Helen and Muriel E. Zimmerman. Functional Fashions for the Physically Handicapped. New York: Occupational Therapy Service, Institute of Physical Medicine and Rehabilitation, 1961.
9. Dorland's Pocket Dictionary. Toronto: W.B. Saunders Company, 1977.
10. Flexible Fashions: Clothing Tips and Ideas for the Woman with Arthritis. Washington, D.C.: U.S.D. HEW Public Health Service Publication #1814, 1968.
11. Friend, Shirley E., Judith Zaccagnini, and Marilyn Bartak Sullivan. "Meeting the Clothing Needs of Handicapped Children." Journal of Home Economics, 65 (May 1973): 25-27.
12. Hallenbeck, Phyllis N. "Special Clothing for the Handicapped: Review of Research and Resources." Rehabilitation Literature, 27, (February 1966): 34-40.

13. Hindshaw, Edith and Dorothy Barrier. Physically Handicapped Aids to Self Help in Homemaking, Grooming, and Clothing. Raleigh, North Carolina: North Carolina State University Agricultural Extension Service, 1974.
14. Horn, Marilyn J. The Second Skin: An Interdisciplinary Study of Clothing. Boston: Houghton Mifflin Company, 1968.
15. Kellor, Majorie O.T.R., Rosemary Kondrasuk O.T.R., Iver Iversen M.S., Judy Frost B.A., Norman Silberberg Ph.D., and Marylyn Hoglund. Technical Manual: Hand Strength and Dexterity Tests. Minneapolis: Sister Kenny Institute Publication #721, 1977.
16. Kernaleguen, Anne P. Clothing for the Handicapped. Edmonton: University of Alberta Press, 1978.
17. Kernaleguen, Anne P. "Clothing for the Handicapped." Physiotherapy Canada. 30 (May/June 1978): 135-138.
18. Levitan-Rheingold, Nancy , Eleanor Boettke Hotte, and David R. Mandel, Ph.D. "Learning to Dress: A Fundamental Skill Toward Independence for the Disabled." Rehabilitation Literature. 41 (March/April, 1980): 72-77.
19. Loether, Herman J. and Donald G. McTavish Descriptive and Inferential Statistics: An Introduction. Boston: Allyn and Bacon Inc. 1977.
20. Lowman, Edward W., M.D. and Judith Lannefeld Klinger. Aids to Independent Living. New York: McGraw-Hill, 1969.
21. Macartney, P., M.A.O.T. Clothes Sense for Handicapped Adults of All Ages. London: Disabled Living Foundation, 1973.
22. Madsen, Jean Kirsten. "Adaptions of Daytime Dresses for Women with Rheumatoid Arthritis." Master's Thesis, Purdue University, 1967.
23. Melvin, Jeanne L. Rheumatic Disease: Occupational Therapy and Rehabilitation. Philadelphia: F.A. Davis Company, 1978.
24. Newton, Audrey. "Clothing: A Positive Part of the Rehabilitation Process." Journal of Rehabilitation. 42 (September/October, 1976): 18-22.
25. Nie, Norman H., C. Haldai Hull, Jean G. Jenkins, Karin Steinbrenner, and Dale H. Bent. Statistical Package for the Social Sciences (second edition). New York: McGraw-Hill, 1975.
26. Reich, Naomi. "Clothing for the Handicapped and Disabled." Rehabilitation Literature, 37 (October 1976): 290-294.

27. Reich, Naomi, Patricia Otten, and Marie Negri Carver. Clothing for Handicapped People: An Annotated Bibliography and Resource List. Washington: The President's Committee on Employment of the Handicapped, 1979.
28. Reich, Naomi and Elizabeth Shannon. "Handicap: Common Physical Limitations and Clothing Related Needs." Home Economics Research Journal, 8 (July 1980): 437-444.
29. Rusk, Howard A. and Eugene J. Taylor. "Functional Fashions for the Physically Handicapped." Journal of American Medical Association, 169 (April 1959): 1598-1600.
30. Ruston, Rosemary. Dressing for Disabled People: A Manual for Nurses and Others. London: The Disabled Living Foundation, 1977.
31. Schwab, Lois O. and Margaret Sindelar. "Clothing for the Physically Disabled Homemaker." Rehabilitation Record, 14 (March/April 1973): 30-34.
32. Schuster, Jan M. "Preferred Style Features in Dresses for Physically Handicapped, Elderly Women." Master's Thesis, Oklahoma State University, 1973.
33. Shannon, Elizabeth and Naomi Reich. "Clothing and Related Needs of Physically Handicapped Persons." Rehabilitation Literature. 40 (January 1979): 2-6.
34. Talon/Velcro. Convenience Clothing and Closures. New York: Talon Consumer Education and Velcro Corporation.
35. Trombly, Catherine Anne, O.T.R., and Anna Deane Scott, O.T.R. Occupational Therapy for Physical Dysfunction. Baltimore: The Williams & Wilkins Co., 1977.
36. Warden, Jessie and Krista Dedmon. "Clothing Design Uses Style and Utility." Journal of Rehabilitation, 41 (July/August 1975): 17-19, 24.
37. White, Louise Wendt and Merry Jo Dallas. "Clothing Adaptions: The Occupational Therapist and the Clothing Designer Collaborate." The American Journal of Occupational Therapy. 31 (February 1977): 90-94.
38. Wolfson, Sheila Rae, "A Study of the Clothing Needs of Arthritic Women." Master's Thesis, University of Maryland, College Park, Maryland, 1969.
39. Zaccagnini, Judith. "Adaptive Fasteners of Ready-to-Wear Knit Pullover Shirts for Children with Cerebral Palsy." Master's Thesis, Kansas State University, Manhattan, Kansas, 1970.

40. Zimmerman, Zelda Laverne Gilbertson. "Measurement of the Articulation Occurring in the Upper Extremity Needed to Reach the Limits of Garment Closures." Master's Thesis, Kansas State University, Manhattan, Kansas, 1972.
41. Yep, Jacquelyn Orlando. "Tools for Aiding Physically Disabled Individuals Increase Independence in Dressing." Journal of Rehabilitation, 43 (November/December 1977): 39-41.

**Appendix A**  
**SELF-HELP CLOTHING PUBLICATIONS**

#### EXAMPLES OF PUBLISHED WORKS (U.S.)

1. Bare, Clare, Eleanor Boettke, and Neva Waggoner. Self Help Clothing for Handicapped Children. Chicago: National Easter Seal Society, 1962.
2. Bowar, Mariam T. R.M., O.T.R. Clothing for the Handicapped: Fashion Adaptions for Adults and Children. Minneapolis: Sister Kenny Institute, 1977.
3. Brown, Mary Eleanor. "Self-Help Clothing." Orthotics, Etcetera. Sidney Licht, M.D. (editor). New Haven: Elizabeth Licht Publisher, 1966: 601-645.
4. Flexible Fashions: Clothing Tips and Ideas for the Woman with Arthritis. Washington, D.C.: U.S.D. HEW Public Health Service, Publication #1814, 1968.
5. Hindshaw, Edith and Dorothy Barrier. Physically Handicapped Aids to Self Help in Homemaking, Grooming, and Clothing. Raleigh, North Carolina: North Carolina State University Agricultural Extension Service, 1974.
6. Hotte, Eleanor Boettke. Self Help Clothing for Children who have Physical Disabilities. Chicago: National Easter Seal Society, 1979.
7. May, Elizabeth E., Waggoner, Neva R., and Eleanor Boettke Hotte. Independent Living for the Handicapped and the Elderly. Boston: Houghton Mifflin Company, 1974.
8. Scott, Clarice. Clothes for the Physically Handicapped Homemaker. Washington, D.C.: U.S. Department of Agriculture Publication #12, 1961.
9. Yep, Jacquelyn. Clothes to Fit Your Needs. Ames, Iowa: Iowa State University Extension Service, 1974.

EXAMPLES OF PUBLISHED WORKS (LONDON, ENGLAND)

1. Clothing Fastenings for the Handicapped and Disabled. London: Disabled Living Foundation, 1974.
2. Forbes, Gillian, M.S.A.O.T. Clothing for the Handicapped Child. London: Disabled Living Foundation, December 1971.
3. Macartney, P., M.A.O.T. Clothes Sense: For Handicapped Adults of all Ages. London: Disabled Living Foundation, June 1973.
4. Rogers, E.E., M.A.O.T., and Stevens, B.M., M.A.O.T. Dressing for the Disabled. London: Disabled Living Foundation, May 1966.
5. Ruston, Rosemary. Dressing for Disabled People: A Manual for Nurses and Others. London: Disabled Living Foundation, 1977.

**Appendix B**

**CLOTHING ENTITIES ACCORDING TO DRESSING DIRECTION**

Clothing Entities According to Dressing Direction\*

| Name      | Coat  | Tube   | Wrap-Around              |
|-----------|---|--|--------------------------|
| Direction | Around  | Overhead or<br>overfeet if<br>openings are<br>large enough | Around                   |
| Openings  | One complete<br>vertical  | One head with<br>or without<br>additional<br>slits         | One complete<br>vertical |
|           | Two armholes<br>or sleeves<br>or shoulder<br>straps                   | Two armholes,<br>sleeves or<br>shoulder<br>straps or none  |                          |
| Garments  | Coats<br>Vests<br>Jackets<br>Dresses<br>Blouses<br>Sweaters<br>Shirts | Dresses<br>Blouses<br>Skirts<br>Sweaters<br>Shirts         | Capes<br>Skirts          |

Clothing Entities According to Dressing Direction (cont'd)

| Name | Coat        | Tube         | Wrap-Around  |
|------|-------------|--------------|--------------|
|      | Bras        |              |              |
|      |             | Garter Belts | Garter Belts |
|      |             | Girdles      | Girdles      |
|      |             |              | Corsets      |
|      |             | Slips        |              |
|      | Undershirts | Undershirts  |              |
|      | Pajama tops | Pajama tops  |              |
|      | Bathrobes   | Nightgowns   |              |
|      |             | Nightshirts  |              |

Clothing Entities According to Dressing Direction (cont'd)

| Name      | Trouser   | Limb   | Head and Neck               |
|-----------|---|--|-----------------------------|
| Direction | Overfeet  | Centripetal  | Centripetal                 |
| Openings  | One trunk<br>Two pantlegs<br>or holes<br>for limbs                        |  |                             |
| Garments  | Trousers<br>Slacks<br>Overalls<br>Pedal Pushers<br><br>Culottes<br>Shorts | Gloves<br>Mittens<br><br><br>Socks<br>Stockings<br><br>Shoes<br>Overshoes<br>Boots | Hats<br>Caps<br><br>Scarves |

Clothing Entities According to Dressing Direction (cont'd)

| Name     | Trouser        | Limb     | Head and Neck |
|----------|----------------|----------|---------------|
| Garments | Underpants     |          |               |
|          | Briefs         |          |               |
|          | Pajama bottoms | Slippers |               |

\* Source Brown, Mary Eleanor. "Self-Help Clothing." Orthotics, Etcet-  
era. Sidney Licht, M.D. (editor). New Haven: Elizabeth Licht Publisher,  
1966:605.

**Appendix C**  
**GARMENT STYLE SELECTION**

### Practical Points to Consider When Choosing Styles\*

#### Seams

Seams should not be uncomfortable to sit or lie on, particularly when skin is tender.

They should have at least five-eighths of an inch turnings, especially in places of tension, and should be well finished. Frayed edges will catch in the working parts of appliances and the seam will quickly disintegrate.

Snipped edges on curved seams at points of stress should be reinforced.

#### Necklines

Pull-on styles, without fastenings, may be chosen.

A low neckline will tend to gape if worn by wheelchair or crutch users.

If they are to be worn with cervical collars they should be high and wide.

Collars which ride up are uncomfortable.

Square and Vee necklines are inclined to tear in the laundry, so it is necessary to look for strong reinforcement at the corners.

Tight necklines cause discomfort.

Large necklines are not suitable for anyone with one shoulder higher than the other because they slip off the lower shoulder.

### Armholes

Raglan sleeves are the simplest to slip on and are the best choice for anyone wearing an upper limb prosthesis or using underarm crutches.

When a sleeveless garment is worn with underarm crutches select a close-fitting armhole - the crutch tops may catch in a deep armhole.

The seams of tight armholes will soon tear.

A diamond shaped gusset at the underarm permits greater freedom of movement and reduces strain on the armhole seams.

### Sleeves

Three quarter sleeves are often the most practical to wear and the easiest to put on.

Full length sleeves may need to be lengthened if underarm crutches are used, or when the elbow joints are fixed, as they tend to ride up.

A wide kimono sleeve will be cool.

Sleeves of thick fabric may be uncomfortable when using elbow crutches.

If an above elbow prosthesis is worn, extra fabric at the elbow is inclined to catch in the hinge. A narrower, slightly stretchy sleeve is preferable.

A loose, full or frilled long sleeve is impractical for wear in a self-propelled wheelchair - choose a three quarter length or narrow sleeve or one with a knitted cuff which can be pushed up.

Sleeves must be easily pulled up if injections are to be given.

### Cuffs

If they are to be put on over an enlarged or deformed hand or a splinted hand or wrist they must be loose or have an opening.

Avoid fastenings for those with the use of only one hand.

Cuffs should be wide enough to permit the passage of a helper's hand when it is difficult to pull a coat sleeve over a jacket.

A tight cuff may obstruct the cable of an upper limb prosthesis and will soon become worn.

Additional width across the back will be necessary for complete freedom of movement at the shoulders when manipulating an upper limb prosthesis, crutches, or a self-propelled chair. This may be provided by:

1. a garment that is gathered or pleated onto a yoke,
2. an inverted pleat at the centre back,
3. small pleats from the shoulder at the back of each armhole,
4. a loose, windcheater style with raglan sleeves.

#### Waist Seams

These tend to restrict movement and, if they ride up, will not return to their former position.

They will be under great strain when the wearer is lifted under the arms.

Shirred waists are more comfortable, but need constant readjustment.

Separates v. one-piece dresses

## FOR:

They may be easier to put on.

If there is a large discrepancy between the measurements of the upper and lower parts of the body, it will be simpler to dress in separates.

If appliances inflict heavier wear on the clothes of the upper or lower body, it will be more practical to wear separates as the single items will be less costly to renew.

If there is a problem of incontinence and clothes become soiled there will be less disturbance to the wearer if only the lower garments need to be changed.

If very free use of the arms and trunk muscles is necessary for mobility well-chosen separates may be less restricting.

Several interchangeable separates add variety to a wardrobe.

## AGAINST:

Separates can be unsightly and cold if they gape when the wearer is being lifted, or when he cannot adjust them unaided. To avoid this a longer top should be chosen.

If weakness of the trunk muscles results in poor sitting posture additional folds of fabric tend to accumulate across the stomach and become

uncomfortable. To overcome this the side seams of the top garment can be opened from the hem to the waist.

#### Elastic waists in trousers and skirts

They will be easier to put on one-handed.

They may be more comfortable during prolonged sitting and will help to prevent blouses and skirts from riding up.

#### Pockets

When (walking) sticks, crutches or self-propelled chairs are used, pockets can provide a convenient means of carrying small articles.

A housewife will find deep, roomy pockets on aprons or overalls useful. Separate pockets on a waistband may be used during household activities.

Pockets for crutch users should not protrude and may be less bulky if constructed inside the garment.

They must be positioned where they can be easily reached.

An oblique opening to pockets situated on the front of trousers or skirts is best for anyone who is seated. A few stitches at the outer corner can help to keep the contents secure.

High pockets which can be reached with the mouth are helpful to those with minimal arm function.

Pockets fastened with zips, buttons or velcro will prevent contents spilling.

\* Source Macartney, P., M.A.O.T. Clothes Sense for Handicapped Adults of All Ages. London; Disabled Living Foundation, 1973:17-24.

**Appendix D**  
**RECOMMENDED CLOTHING FASTENERS**

## Recommended Clothing Fasteners

### Buttons

- large, flat and round (not ball shaped)
- 5/8" (15 mm) or larger in diameter
- rimmed or with raised edge
- with a shank or raised with a thread or elastic shank
- bone or plastic (not covered in fabric or leather)
- toggle style buttons with fabric or elastic button loop

### Zippers

- nylon coil (metal and invisible types more difficult to manage)
- addition of a metal ring, key ring, ribbon, leather lace, or decorative ornament to increase the area of grasp on the zipper pull
- separating zipper may be difficult for some to fasten
- novelty zippers with large pull tabs and large teeth

### Velcro

- 1/2" to 2" (13 mm to 50 mm) widths available
- assorted colours and strengths (light stress to heavy stress)
- washable and dry cleanable
- Velcro is best used in short sections or as dots rather than long continuous strips
- requires minimal strength or dexterity to open
- permits adjustability in garments (eg. waistbands)

Advantages: easy to apply (machine or hand stitched)

Disadvantages: hook side is abrasive to skin and may snag or catch on other clothing; makes tearing noise when opened; lint gets caught in hook side if fastener is not closed during laundry; some difficulty in alignment.

### Snaps

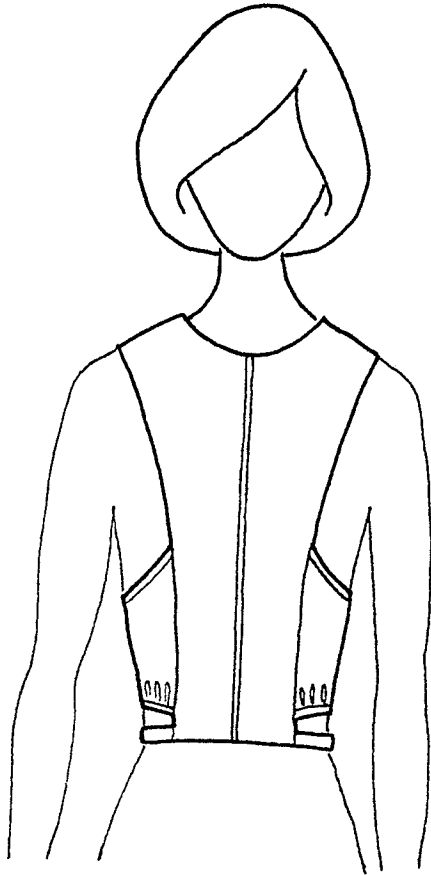
- large ones easier to grasp but some may find this fastener too stiff to close

Hooks & Eyes

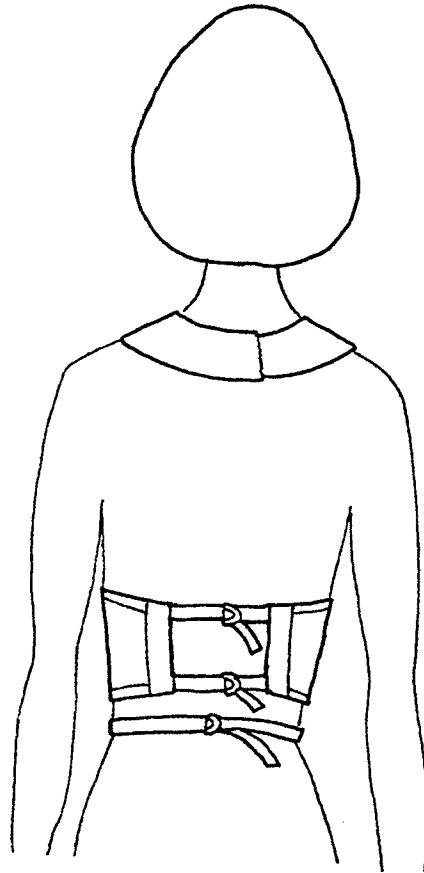
- must be large enough to grasp (eg. covered fur hooks or bathing suit hooks)
- skirt or trouser bar and hook

**Appendix E**  
**VEST DESIGN**

## VEST DESIGN

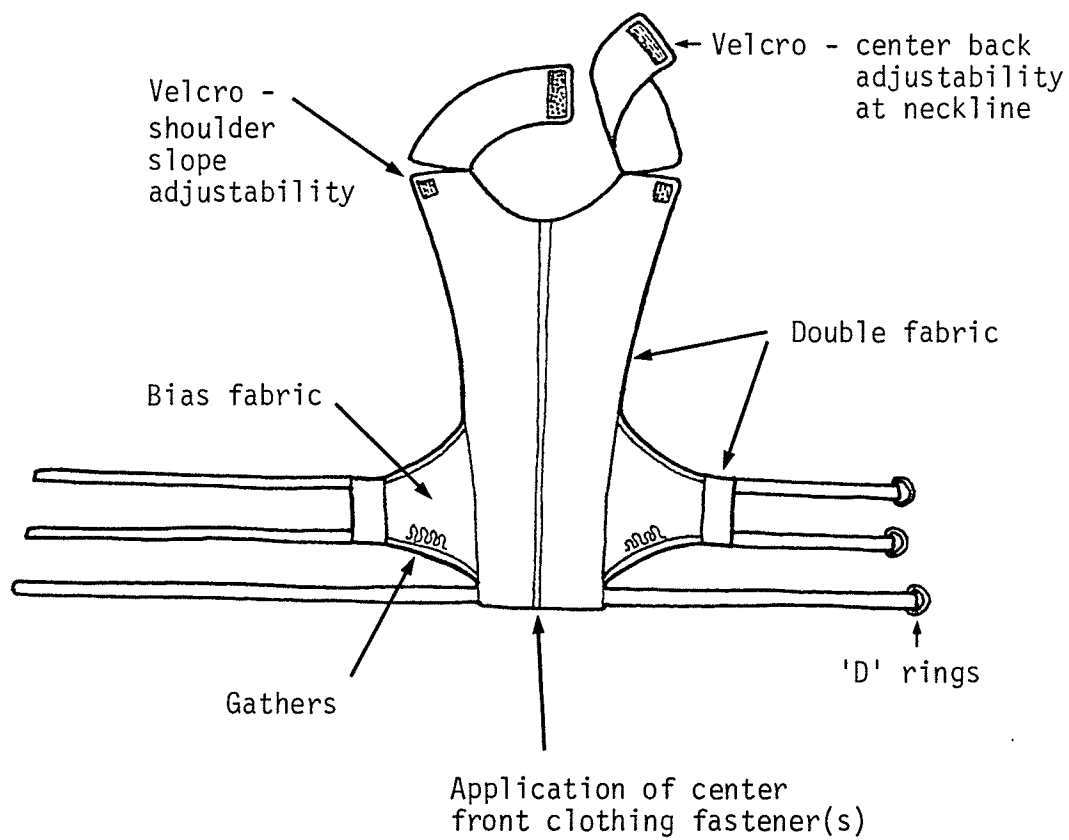


Front View

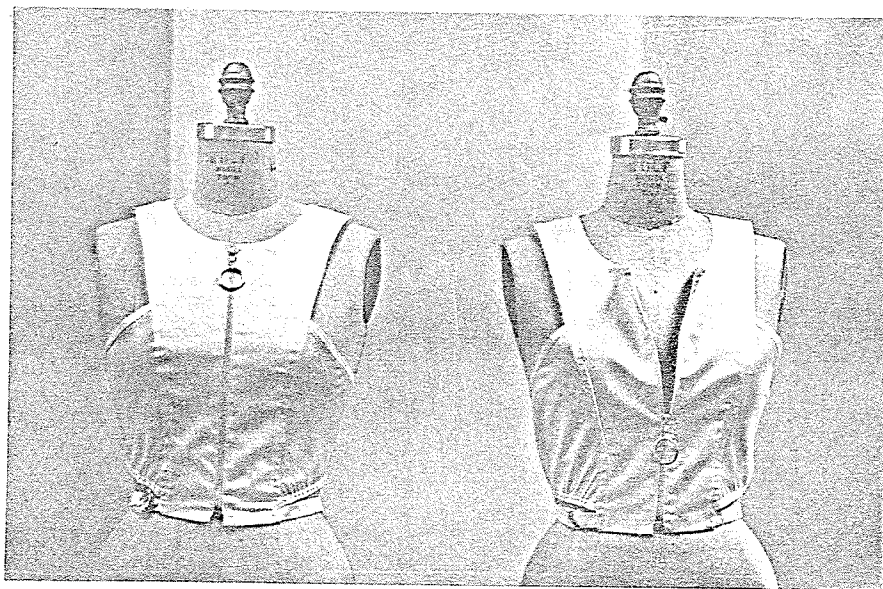
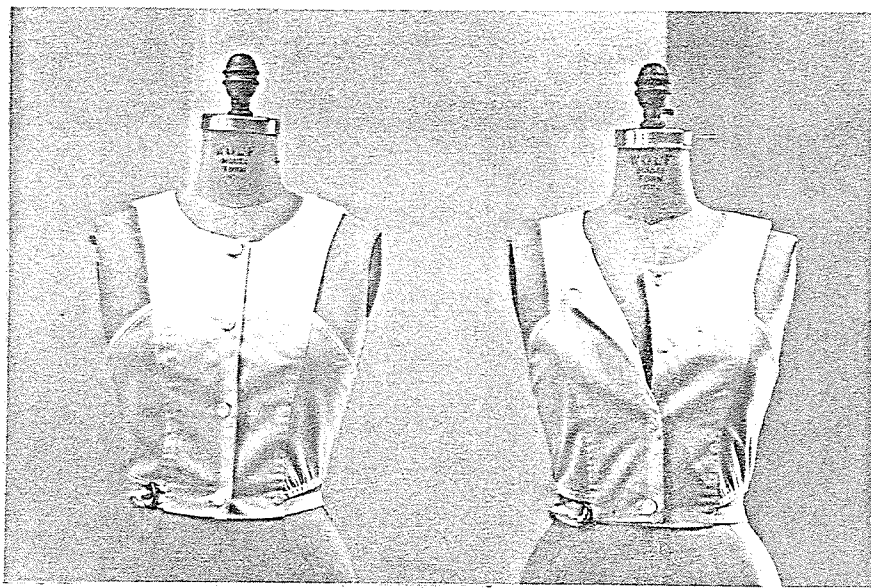


Back View

## VEST DESIGN DETAILS



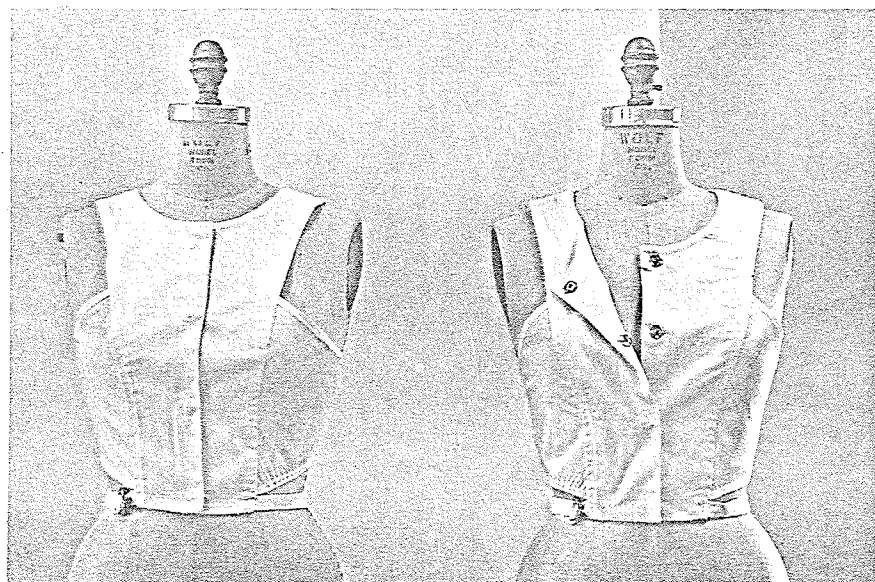
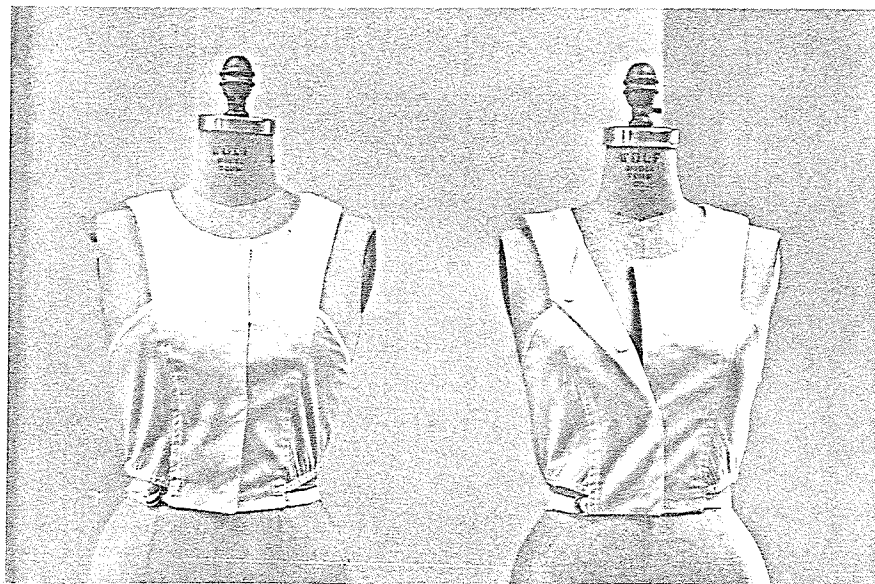
## SET OF FOUR VESTS



Top photograph - Button fasteners

Bottom photograph - Zipper fastener

## SET OF FOUR VESTS



Top photograph - Velcro fasteners

Bottom photograph - Snap fasteners

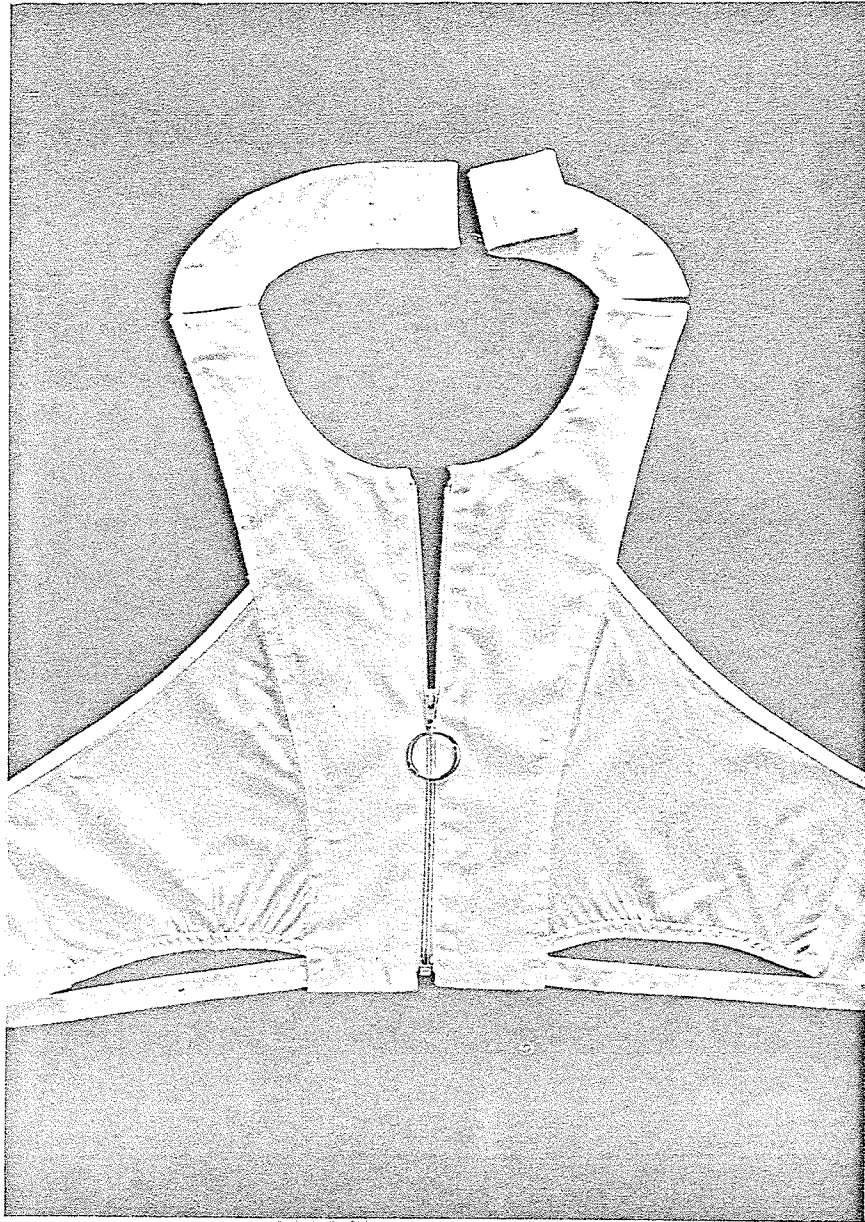
**Appendix F**  
**TESTING VEST DETAILS**

## BUTTONS



Detail of vest showing button closure and neck fitting details.

## ZIPPER



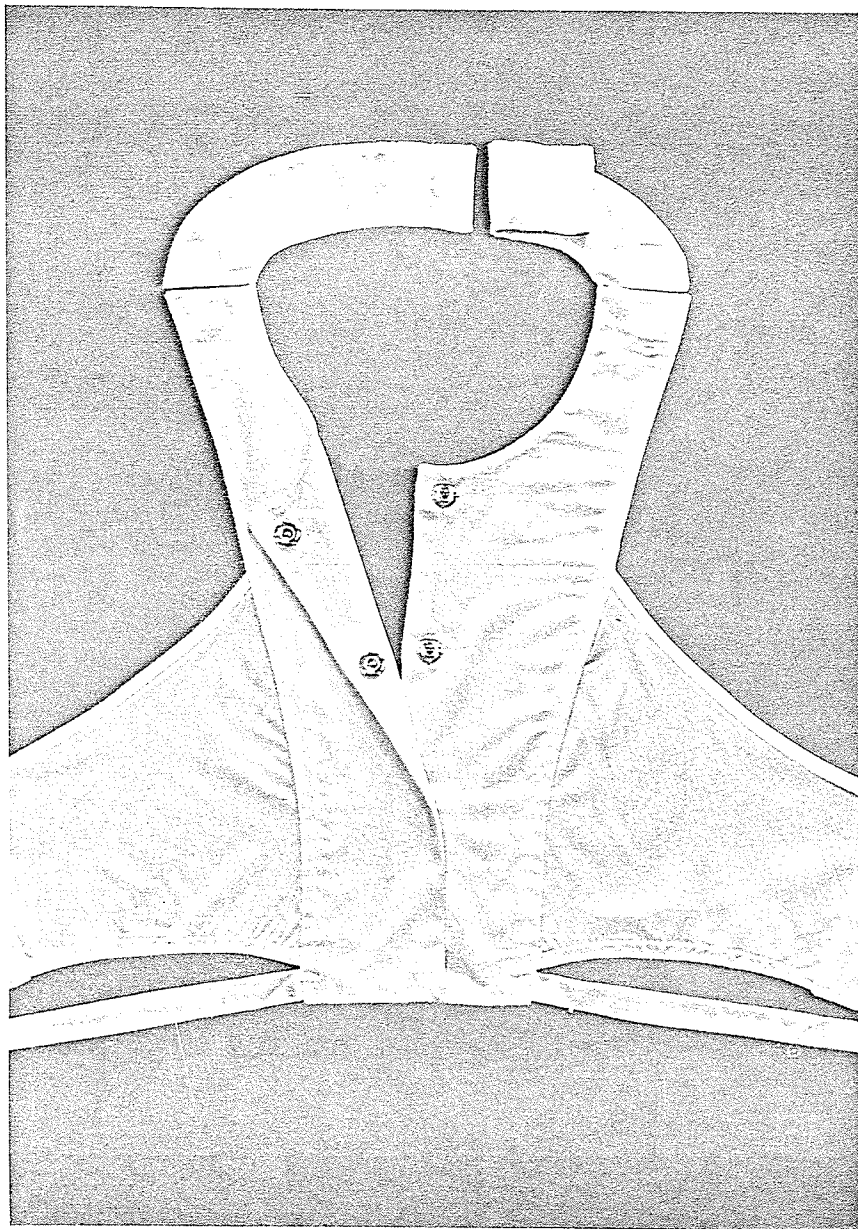
Detail of vest showing zipper closure and neck fitting details.

## VELCRO



Detail of vest showing Velcro closure and neck fitting details.

## SNAPS



Detail of vest showing snap closure and neck fitting details.

**Appendix G**  
**TESTING VEST PROCEDURE**

## TESTING PROCEDURE



Fitting vest to subject - neck detail.

## TESTING PROCEDURE



Fitting vest to subject - 'D' ring details at back.

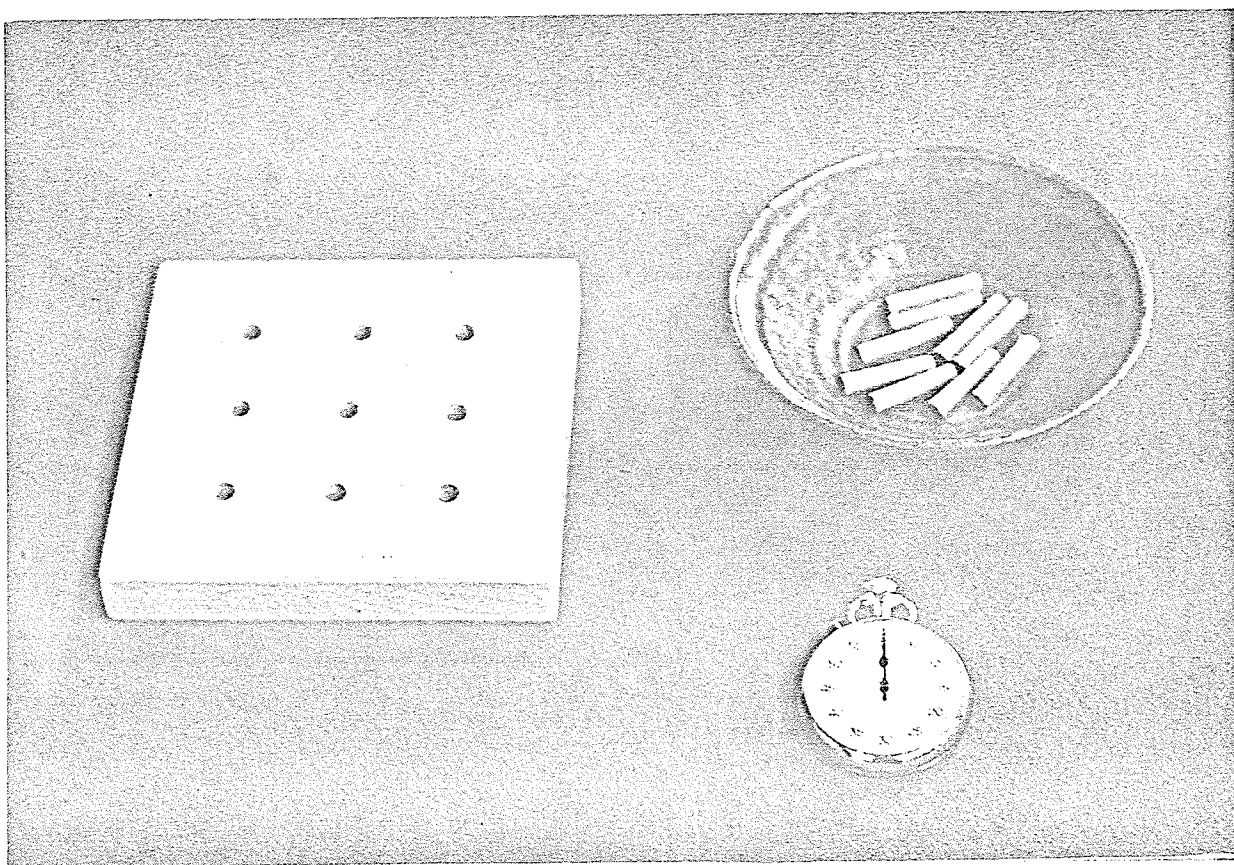
## TESTING PROCEDURE



Subject in process of closing vest with zipper.

**Appendix H**  
**HAND ABILITY TESTS**

## PEG BOARD TEST



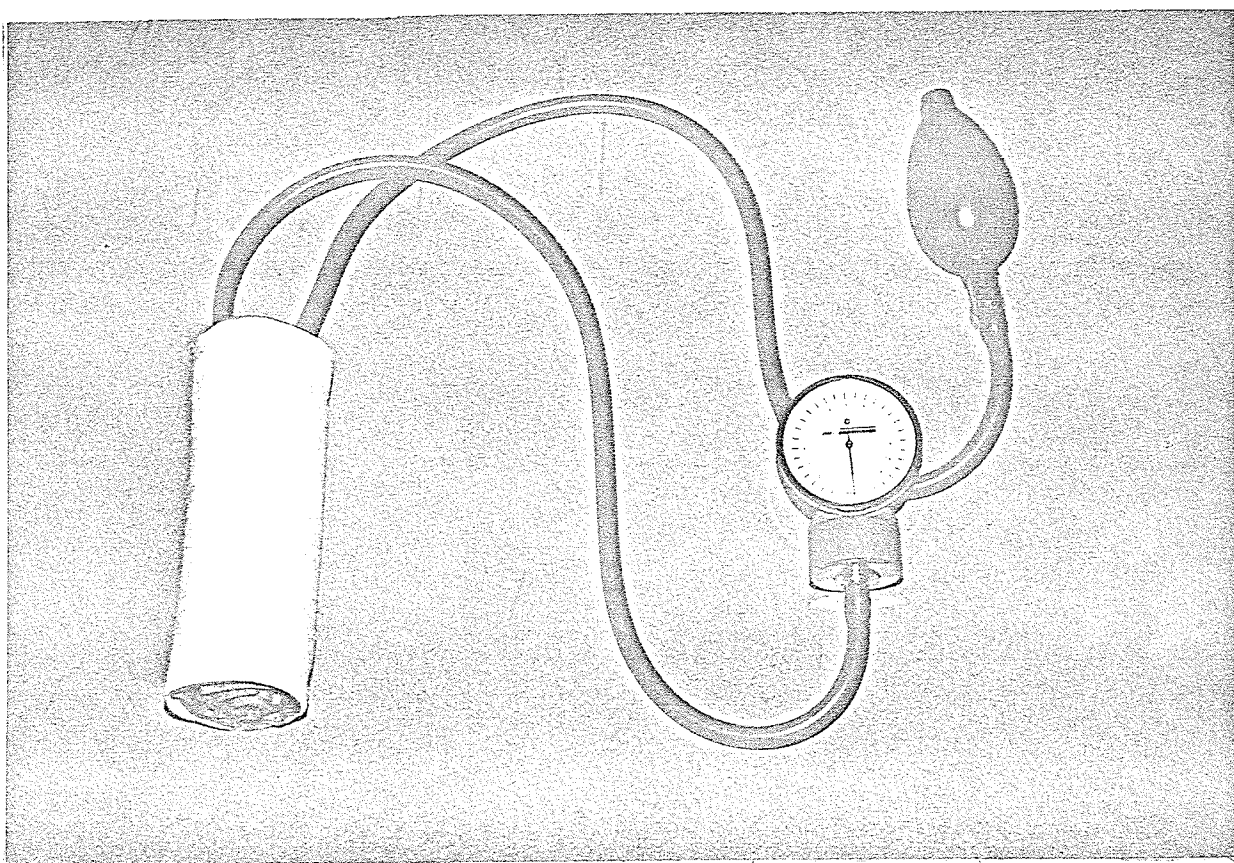
Apparatus for peg board test including: nine-hole peg board (5" square), pegs (1 1/4" by 1/4" in diameter) in shallow saucer, and stopwatch.

## PEG BOARD TEST



Subject being timed in the process of inserting pegs into peg board.

## GRIP STRENGTH TEST



Apparatus for grip strength test showing adapted sphygmomanometer (pressure cuff rolled tightly and held in place by cloth sleeve).

## GRIP STRENGTH TEST











Researcher taking readings of subject's grip strength for right hand  
(note positioning of subject's hand and arm).

**Appendix I**  
**RECORDING/INTERVIEW SHEETS**

## CLOTHING FASTENERS

## 1. BUTTONS - 5/8" (15 mm.), rimmed.


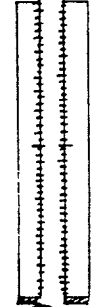
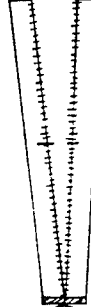
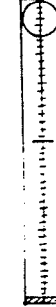
|        |   |   |
|--------|---|---|
| Top    |  |  |
|        |  |  |
|        |  |  |
| Bottom |  |  |
|        | opening order   | closing order   |
| Time   |   |   |

Alignment difficulty:

Total Time:

COMMENTS:

## 2. SEPARATING ZIPPER - nylon coil with 1" (25 mm.) ring.









|        |   |  |   |   |
|--------|---|--|---|---|
| Top    |  |  |  |  |
| Bottom |   |  |   |   |
| Time   |   |  |   |   |

Alignment difficulty:

Total Time:

COMMENTS:

## 3. VELCRO - 3/4" (18 mm.), medium stress.









|        |   |   |
|--------|---|---|
| Top    |   |   |
|        |  |  |
|        |  |  |
| Bottom |  |  |
|        | opening order   | closing order   |
| Time   |   |   |

Alignment Difficulty:

Total Time:

COMMENTS:

## 4. LARGE SNAPS - 5/8" (15 mm.)

|        |  |   |
|--------|--|---|
| Top    |   |   |
|        |  |  |
|        |  |  |
| Bottom |  |  |
|        | opening order  | closing order   |
| Time   |  |   |

Alignment Difficulty:

Total Time:

COMMENTS:

Visual hand deformity

- ☐ none  
☐ slight  
☐ moderate  
☐ severe

How long have you had arthritis?

- ☐ less than one year  
☐ 1 - 2 years  
☐ 3 - 5 years  
☐ 6 - 9 years  
☐ 10 years and over

What type of arthritis do you have?

# INTERVIEW SCHEDULE

In terms of handling ease, which clothing fastener did you find the hardest to handle?

|         |                          |
|---------|--------------------------|
| Buttons | <input type="checkbox"/> |
| Zipper  | <input type="checkbox"/> |
| Velcro  | <input type="checkbox"/> |
| Snaps   | <input type="checkbox"/> |

In terms of handling ease, which clothing fastener did you find the easiest to handle?

|         |                          |
|---------|--------------------------|
| Buttons | <input type="checkbox"/> |
| Zipper  | <input type="checkbox"/> |
| Velcro  | <input type="checkbox"/> |
| Snaps   | <input type="checkbox"/> |

In terms of handling ease, please rank each type of clothing fastener according to difficulty on a scale of 1 to 5 ( 1 - easiest; 5 - hardest ) :

|          |         |   |   |   |   |   |         |
|----------|---------|---|---|---|---|---|---------|
| Buttons: | easiest | 1 | 2 | 3 | 4 | 5 | hardest |
| Zipper:  |         | 1 | 2 | 3 | 4 | 5 |         |
| Velcro:  |         | 1 | 2 | 3 | 4 | 5 |         |
| Snaps:   |         | 1 | 2 | 3 | 4 | 5 |         |

In terms of appearance, which clothing fastener do you find "looks the best"?

|         |                          |
|---------|--------------------------|
| Buttons | <input type="checkbox"/> |
| Zipper  | <input type="checkbox"/> |
| Velcro  | <input type="checkbox"/> |
| Snaps   | <input type="checkbox"/> |

In terms of appearance, which clothing fastener do you find "looks the least attractive"?

|         |                          |
|---------|--------------------------|
| Buttons | <input type="checkbox"/> |
| Zipper  | <input type="checkbox"/> |
| Velcro  | <input type="checkbox"/> |
| Snaps   | <input type="checkbox"/> |

In terms of appearance, rank each type of clothing fastener according to preference on a scale of 1 to 5 ( 1 - most preferred; 5 - least preferred ) :

|          |                |   |   |   |   |   |                 |
|----------|----------------|---|---|---|---|---|-----------------|
| Buttons: | most preferred | 1 | 2 | 3 | 4 | 5 | least preferred |
| Zipper:  |                | 1 | 2 | 3 | 4 | 5 |                 |
| Velcro:  |                | 1 | 2 | 3 | 4 | 5 |                 |
| Snaps:   |                | 1 | 2 | 3 | 4 | 5 |                 |

In your opinion, would you wear \_\_\_\_\_ as a clothing fastener in a blouse with a front closure?

|         | Yes                      | Maybe                    | No                       |
|---------|--------------------------|--------------------------|--------------------------|
| Buttons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Zipper  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Velcro  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Snaps   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

In your opinion, would you wear \_\_\_\_\_ as a clothing fastener in a vest with a front closure?

|         | Yes                      | Maybe                    | No                       |
|---------|--------------------------|--------------------------|--------------------------|
| Buttons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Zipper  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Velcro  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Snaps   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

In your opinion, would you wear \_\_\_\_\_ as a clothing fastener in a jacket with a front closure?

|         | Yes                      | Maybe                    | No                       |
|---------|--------------------------|--------------------------|--------------------------|
| Buttons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Zipper  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Velcro  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Snaps   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

In your opinion, would you wear \_\_\_\_\_ as a clothing fastener in a dress with a front closure?

|         | Yes                      | Maybe                    | No                       |
|---------|--------------------------|--------------------------|--------------------------|
| Buttons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Zipper  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Velcro  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Snaps   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

In your opinion, would you wear \_\_\_\_\_ as a clothing fastener in a coat with a front closure?

|         | Yes                      | Maybe                    | No                       |
|---------|--------------------------|--------------------------|--------------------------|
| Buttons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Zipper  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Velcro  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Snaps   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

COMMENTS:

#### HAND ABILITY

CO-ORDINATION and DEXTERITY: NINE-HOLE PEG TEST (  $1\frac{1}{4}$ " x  $\frac{1}{4}$ " pegs )

| Age | Age Norm Used | Right Hand |   | Left Hand |   |
|-----|---------------|------------|---|-----------|---|
|     |               | Seconds    | % | Seconds   | % |
|     |               |            |   |           |   |

GRIP STRENGTH: ADAPTED SPHYGMOMANOMETER TEST

|          | Starting Point (mm Hg) | Right Hand (mm Hg) | Left Hand (mm Hg) |
|----------|------------------------|--------------------|-------------------|
| Trial 1. |                        |                    |                   |
| Trial 2. |                        |                    |                   |
| Trial 3. |                        |                    |                   |
| Average  |                        |                    |                   |

COMMENTS:

**Appendix J**  
**CONSENT FORM**

Clothing Research Project  
Department of Clothing and Textiles  
University of Manitoba

CONSENT FORM

As a volunteer in this research project on clothing fasteners, I am aware of the nature of the problem being investigated. I acknowledge having been briefed on the project and I am aware of the requirements to be fulfilled by me as a subject.

I am also aware that my responses during the interview will be kept confidential. It is my understanding that I may withdraw from this project at any time without penalty from the investigator.

Dated the \_\_\_\_\_ day of \_\_\_\_\_ 1980.

Signature \_\_\_\_\_.

**Appendix K**  
**HAND DEXTERITY PERCENTILE CHART**

## NINE-HOLE PEG SET - FEMALE

(Time in Seconds)

| Age Group | Percentile |      |      |      |      |      |      |      |      |      |
|-----------|------------|------|------|------|------|------|------|------|------|------|
|           | 10th       |      | 25th |      | 50th |      | 75th |      | 90th |      |
|           | Hand       |      |      |      |      |      |      |      |      |      |
|           | R          | L    | R    | L    | R    | L    | R    | L    | R    | L    |
| 20-24     | 21.0       | 22.5 | 18.5 | 20.0 | 16.5 | 17.0 | 14.5 | 14.0 | 12.5 | 11.5 |
| 25-29     | 22.0       | 23.5 | 19.5 | 21.0 | 17.0 | 18.0 | 15.0 | 15.0 | 13.0 | 12.5 |
| 30-34     | 22.5       | 24.5 | 20.0 | 22.0 | 17.5 | 19.0 | 15.5 | 16.0 | 13.5 | 13.5 |
| 35-39     | 23.0       | 25.5 | 20.5 | 22.5 | 18.5 | 20.0 | 16.5 | 17.0 | 14.0 | 14.0 |
| 40-44     | 23.5       | 26.5 | 21.5 | 23.5 | 19.0 | 21.0 | 17.0 | 17.5 | 15.0 | 15.0 |
| 45-49     | 24.5       | 27.5 | 22.0 | 24.5 | 19.5 | 22.0 | 17.5 | 18.5 | 15.5 | 16.0 |
| 50-54     | 25.0       | 28.5 | 22.5 | 25.5 | 20.5 | 22.5 | 18.0 | 19.5 | 16.0 | 17.0 |
| 55-59     | 25.5       | 29.0 | 23.5 | 26.0 | 21.0 | 23.5 | 19.0 | 20.5 | 16.5 | 17.5 |
| 60-64     | 26.5       | 30.0 | 24.0 | 27.0 | 22.0 | 24.5 | 19.5 | 21.5 | 17.5 | 18.5 |
| 65-69     | 27.0       | 31.0 | 24.5 | 28.0 | 22.5 | 25.0 | 20.0 | 22.5 | 18.0 | 19.5 |
| 70-74     | 27.5       | 32.0 | 25.5 | 29.0 | 23.0 | 26.0 | 21.0 | 23.0 | 18.5 | 20.5 |
| 75-79     | 28.0       | 33.0 | 26.0 | 30.0 | 23.5 | 27.0 | 21.5 | 24.0 | 19.5 | 21.0 |
| 80-84     | 29.0       | 33.5 | 26.5 | 30.5 | 24.5 | 28.0 | 22.0 | 25.0 | 20.0 | 22.0 |

Source: Kellor, Marjorie O.T.R., Rosemary Kondrasuk O.T.R., Iver Iversen M.S., Judy Frost B.A., Norman Silberberg Ph.D., and Marylyn Hoglund.

Technical Manual: Hand Strength and Dexterity Tests. Minneapolis: Sister Kenny Institute Publication #721, 1977: 35.

**Appendix L**  
**CROSSTABULATION TABLES**

TABLE 17

Average Grip Strength (GS) by Handling Ease (HE)

( Crosstabulations with 'significant' lambda values.)

## 17.1 - Average Grip Strength (Left Hand) by Handling Ease (Zipper)

|   |         | Handling Ease - Zipper |    |      |    |    |
|---|---------|------------------------|----|------|----|----|
|   |         | Easy                   |    | Hard |    |    |
|   |         | 1.                     | 2. | 3.   | 4. | 5. |
| Average<br>Grip<br>Strength<br><br>Left<br>Hand | Low 1.  | 5                      | 1  | 0    | 0  | 2  |
|   | 2.      | 10                     | 6  | 0    | 0  | 0  |
|   | 3.      | 3                      | 5  | 3    | 0  | 1  |
|   | 4.      | 3                      | 1  | 1    | 0  | 1  |
|   | 5.      | 0                      | 2  | 1    | 1  | 0  |
|   | 6.      | 1                      | 0  | 0    | 0  | 0  |
|   | High 7. | 0                      | 1  | 0    | 1  | 0  |

Symmetric Lambda Value = 0.18333

Direction of Relationship = Low Grip Strength  
 Easy to Handle  
 (-GS/+HE)

TABLE 18 .

Handling Ease (HE) by Attractiveness (AT)

( Crosstabulations with 'significant' lambda values.)

18.1 - Handling Ease (Snaps) by Attractiveness (Snaps)

|   |         | Attractiveness - Snaps |    |     |    |    |
|---|---------|------------------------|----|-----|----|----|
|   |         | High                   |    | Low |    |    |
|   |         | 1.                     | 2. | 3.  | 4. | 5. |
| Handling<br>Ease<br><br>Snaps<br><br>Hard | Easy 1. | 2                      | 0  | 1   | 0  | 0  |
|   | 2.      | 2                      | 1  | 1   | 1  | 1  |
|   | 3.      | 0                      | 1  | 4   | 4  | 2  |
|   | 4.      | 0                      | 2  | 0   | 1  | 6  |
|   | 5.      | 0                      | 2  | 3   | 3  | 13 |

Symmetric Lambda Value = 0.15789

Direction of Relationship = Hard to Handle  
Low Attractiveness  
(-HE/-AT)

TABLE 19

Handling Ease (HE) by Acceptability in Garments (AC)

(Crosstabulations with 'significant' lambda values.)

## 19.1 - Handling Ease (Velcro) by Acceptability of Velcro in a Dress.

|                            |         | Acceptability of<br>Velcro in a Dress |    |    |
|----------------------------|---------|---------------------------------------|----|----|
|                            |         | Yes                                   | No |    |
|                            |         | 1.                                    | 2. | 3. |
| Handling<br>Ease<br>Velcro | Easy 1. | 18                                    | 1  | 6  |
|                            | 2.      | 7                                     | 1  | 9  |
|                            | 3.      | 2                                     | 2  | 2  |
|                            | 4.      | 0                                     | 0  | 0  |
|                            | Hard 5. | 0                                     | 0  | 0  |

Symmetric Lambda Value = 0.15217

Direction of Relationship = Easy to Handle  
 Acceptable in a Dress  
 (+HE/+AC)

TABLE 19

Handling Ease (HE) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

19.2 - Handling Ease (Snaps) by Acceptability of Snaps in a Blouse.

|                           |         | Acceptability of<br>Snaps in a Blouse |    |    |
|---------------------------|---------|---------------------------------------|----|----|
|                           |         | Yes                                   | No |    |
|                           |         | 1.                                    | 2. | 3. |
| Handling<br>Ease<br>Snaps | Easy 1. | 2                                     | 0  | 1  |
|                           | 2.      | 4                                     | 0  | 2  |
|                           | 3.      | 3                                     | 4  | 4  |
|                           | 4.      | 4                                     | 2  | 3  |
| Hard                      | 5.      | 0                                     | 0  | 21 |

Symmetric Lambda Value = 0.25000

Direction of Relationship = Hard to Handle

Not Acceptable in  
a Blouse

(-HE/-AC)

TABLE 19

Handling Ease (HE) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

19.3 - Handling Ease (Snaps) by Acceptability of Snaps in a Vest.

|                           |         | Acceptability of<br>Snaps in a Vest |    |    |
|---------------------------|---------|-------------------------------------|----|----|
|                           |         | Yes                                 | No |    |
|                           |         | 1.                                  | 2. | 3. |
| Handling<br>Ease<br>Snaps | Easy 1. | 2                                   | 0  | 1  |
|                           | 2.      | 4                                   | 0  | 2  |
|                           | 3.      | 8                                   | 0  | 3  |
|                           | 4.      | 5                                   | 0  | 4  |
|                           | Hard 5. | 0                                   | 0  | 21 |

Symmetric Lambda Value = 0.35417

Direction of Relationship = Hard to Handle

Not Acceptable in  
a Vest

(-HE/-AC)

TABLE 19

Handling Ease (HE) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

## 19.4 - Handling Ease (Snaps) by Acceptability of Snaps in a Jacket.

|                           |         | Acceptability of<br>Snaps in a Jacket |    |    |
|---------------------------|---------|---------------------------------------|----|----|
|                           |         | Yes                                   | No |    |
|                           |         | 1.                                    | 2. | 3. |
| Handling<br>Ease<br>Snaps | Easy 1. | 3                                     | 0  | 0  |
|                           | 2.      | 2                                     | 0  | 4  |
|                           | 3.      | 3                                     | 0  | 8  |
|                           | 4.      | 4                                     | 1  | 4  |
|                           | Hard 5. | 0                                     | 1  | 20 |

Symmetric Lambda Value = 0.16279

Direction of Relationship = Hard to Handle

Not Acceptable in  
a Jacket

(-HE/-AC)

TABLE 19

Handling Ease (HE) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

19.5 - Handling Ease (Snaps) by Acceptability of Snaps in a Dress.

|                           |         | Acceptability of<br>Snaps in a Dress |    |    |
|---------------------------|---------|--------------------------------------|----|----|
|                           |         | Yes                                  | No |    |
|                           |         | 1.                                   | 2. | 3. |
| Handling<br>Ease<br>Snaps | Easy 1. | 2                                    | 0  | 1  |
|                           | 2.      | 2                                    | 1  | 3  |
|                           | 3.      | 3                                    | 4  | 4  |
|                           | 4.      | 3                                    | 0  | 6  |
|                           | Hard 5. | 0                                    | 1  | 19 |

Symmetric Lambda Value = 0.15556

Direction of Relationship = Hard to Handle

Not Acceptable in  
a Dress

(-HE/-AC)

TABLE 20

Attractiveness (AT) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

20.1 - Attractiveness (Buttons) by Acceptability of Buttons in a Dress.

|                           |         | Acceptability of<br>Buttons in a Dress |    |    |
|---------------------------|---------|--|----|----|
|                           |         | Yes                                    | No |    |
|                           |         | 1.                                     | 2. | 3. |
| Attractiveness<br>Buttons | High 1. | 16                                     | 0  | 3  |
|                           | 2.      | 12                                     | 0  | 0  |
|                           | 3.      | 7                                      | 1  | 4  |
|                           | 4.      | 0                                      | 1  | 1  |
|                           | Low 5.  | 0                                      | 0  | 4  |

Symmetric Lambda Value = 0.15909

Direction of Relationship = High Attractiveness  
Acceptable in a Dress  
(+AT/+AC)

TABLE 20

Attractiveness (AT) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

20.2 - Attractiveness (Zipper) by Acceptability of Zipper in a Blouse.

|                          |         | Acceptability of<br>Zipper in a Blouse |    |    |
|--------------------------|---------|--|----|----|
|                          |         | Yes                                    | No |    |
|                          |         | 1.                                     | 2. | 3. |
| Attractiveness<br>Zipper | High 1. | 12                                     | 2  | 3  |
|                          | 2.      | 5                                      | 4  | 7  |
|                          | 3.      | 0                                      | 4  | 4  |
|                          | 4.      | 1                                      | 0  | 2  |
| Low                      | 5.      | 3                                      | 1  | 2  |

Symmetric Lambda Value = 0.20968

Direction of Relationship = High Attractiveness  
Acceptable in a Blouse  
(+AT/+AC)

TABLE 20

Attractiveness (AT) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

## 20.3 - Attractiveness (Zipper) by Acceptability of Zipper in a Vest.

|                          |         | Acceptability of<br>Zipper in a Vest |    |    |
|--------------------------|---------|--------------------------------------|----|----|
|                          |         | Yes                                  | No |    |
|                          |         | 1.                                   | 2. | 3. |
| Attractiveness<br>Zipper | High 1. | 10                                   | 7  | 0  |
|                          | 2.      | 7                                    | 2  | 7  |
|                          | 3.      | 4                                    | 3  | 1  |
|                          | 4.      | 1                                    | 0  | 2  |
|                          | Low 5.  | 2                                    | 1  | 3  |

Symmetric Lambda Value = 0.15254

Direction of Relationship = High Attractiveness  
 Acceptable in a Vest  
 (+AT/+AC)

TABLE 20

Attractiveness (AT) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

20.4 - Attractiveness (Zipper) by Acceptability of Zipper in a Coat.

|                          |         | Acceptability of<br>Zipper in a Coat |    |    |
|--------------------------|---------|--------------------------------------|----|----|
|                          |         | Yes                                  | No |    |
|                          |         | 1.                                   | 2. | 3. |
| Attractiveness<br>Zipper | High 1. | 11                                   | 2  | 4  |
|                          | 2.      | 6                                    | 3  | 7  |
|                          | 3.      | 4                                    | 0  | 4  |
|                          | 4.      | 0                                    | 0  | 3  |
|                          | Low 5.  | 2                                    | 0  | 4  |

Symmetric Lambda Value = 0.16667

Direction of Relationship = High Attractiveness  
Acceptable in a Coat  
(+AT/+AC)

TABLE 20

Attractiveness (AT) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

20.5 - Attractiveness (Velcro) by Acceptability of Velcro in a Blouse.

|                          |         | Acceptability of<br>Velcro in a Blouse |    |    |
|--------------------------|---------|--|----|----|
|                          |         | Yes                                    | No |    |
|                          |         | 1.                                     | 2. | 3. |
| Attractiveness<br>Velcro | High 1. | 11                                     | 0  | 2  |
|                          | 2.      | 8                                      | 1  | 4  |
|                          | 3.      | 5                                      | 6  | 4  |
|                          | 4.      | 1                                      | 0  | 4  |
|                          | Low 5.  | 0                                      | 1  | 3  |

Symmetric Lambda Value = 0.21667

Direction of Relationship = High Attractiveness  
 Acceptable in a Blouse  
 (+AT/+AC)

TABLE 20

Attractiveness (AT) by Acceptability in Garments (AC)

(Crosstabulations with 'significant' lambda values.)

20.6 - Attractiveness (Velcro) by Acceptability of Velcro in a Jacket.

|                          |         | Acceptability of<br>Velcro in a Jacket |    |    |
|--------------------------|---------|--|----|----|
|                          |         | Yes                                    | No |    |
|                          |         | 1.                                     | 2. | 3. |
| Attractiveness<br>Velcro | High 1. | 6                                      | 2  | 5  |
|                          | 2.      | 7                                      | 4  | 2  |
|                          | 3.      | 4                                      | 3  | 8  |
|                          | 4.      | 1                                      | 0  | 4  |
| Low                      | 5.      | 0                                      | 1  | 3  |

Symmetric Lambda Value = 0.15873

Direction of Relationship = Attractive  
 Acceptable in a Jacket  
 (+AT/+AC)

TABLE 20

Attractiveness (AT) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

## 20.7 - Attractiveness (Velcro) by Acceptability of Velcro in a Dress.

|                          |         | Acceptability of<br>Velcro in a Dress |    |    |
|--------------------------|---------|---------------------------------------|----|----|
|                          |         | Yes                                   | No |    |
|                          |         | 1.                                    | 2. | 3. |
| Attractiveness<br>Velcro | High 1. | 11                                    | 0  | 2  |
|                          | 2.      | 8                                     | 0  | 4  |
|                          | 3.      | 7                                     | 4  | 4  |
|                          | 4.      | 1                                     | 0  | 4  |
|                          | Low 5.  | 0                                     | 0  | 4  |

Symmetric Lambda Value = 0.19634

Direction of Relationship = High Attractiveness  
 Acceptable in a Dress  
 (+AT/+AC)

TABLE 20

Attractiveness (AT) by Acceptability in Garments (AC)

( Crosstabulations with 'significant' lambda values.)

## 20.8 - Attractiveness (Snaps) by Acceptability of Snaps in a Blouse.

|                         |         | Acceptability of<br>Snaps in a Blouse |    |    |
|-------------------------|---------|---------------------------------------|----|----|
|                         |         | Yes                                   | No |    |
|                         |         | 1.                                    | 2. | 3. |
| Attractiveness<br>Snaps | High 1. | 4                                     | 0  | 0  |
|                         | 2.      | 4                                     | 0  | 2  |
|                         | 3.      | 3                                     | 2  | 4  |
|                         | 4.      | 0                                     | 2  | 7  |
| Low                     | 5.      | 2                                     | 2  | 18 |

Symmetric Lambda Value = 0.17021

Direction of Relationship = Low Attractiveness  
Not Acceptable in  
a Blouse

(-AT/-AC)

TABLE 21

Handling Ease (HE) by Attractiveness (AT)

"Yes" Responses for Acceptability in Garments (+AC)

( Crosstabulations with 'significant' lambda values.)

21.1 - Handling Ease (Zipper) by Attractiveness (Zipper)  
among those responding "Yes" to Acceptability of Zipper in a Jacket.

## Attractiveness - Zipper

|                                |         | High |    |    |    |    | Low |  |
|--------------------------------|---------|------|----|----|----|----|-----|--|
|                                |         | 1.   | 2. | 3. | 4. | 5. |     |  |
| Handling<br>Ease<br><br>Zipper | Easy 1. | 5    | 6  | 2  | 0  | 0  |     |  |
|                                | 2.      | 4    | 3  | 1  | 1  | 1  |     |  |
|                                | 3.      | 0    | 1  | 0  | 0  | 0  |     |  |
|                                | 4.      | 0    | 0  | 1  | 0  | 0  |     |  |
|                                | Hard 5. | 2    | 0  | 0  | 0  | 0  |     |  |

Symmetric Lambda Value = 0.16667

Direction of Relationship = Easy to Handle  
High Attractiveness  
(+HE/+AT)

TABLE 21

Handling Ease (HE) by Attractiveness (AT)

"Yes" Responses for Acceptability in Garments (+AC)

( Crosstabulations with 'significant' lambda values.)

21.2 - Handling Ease (Velcro) by Attractiveness (Velcro)  
among those responding "Yes" to Acceptability of Velcro in a Jacket.

## Attractiveness - Velcro

|                            |         | High |    |    |    |    | Low |    |    |    |    |
|----------------------------|---------|------|----|----|----|----|-----|----|----|----|----|
|                            |         | 1.   | 2. | 3. | 4. | 5. | 1.  | 2. | 3. | 4. | 5. |
| Handling<br>Ease<br>Velcro | Easy 1. | 3    | 5  | 1  | 1  | 0  |     |    |    |    |    |
|                            | 2.      | 3    | 2  | 1  | 0  | 0  |     |    |    |    |    |
|                            | 3.      | 0    | 0  | 2  | 0  | 0  |     |    |    |    |    |
|                            | 4.      | 0    | 0  | 0  | 0  | 0  |     |    |    |    |    |
|                            | Hard 5. | 0    | 0  | 0  | 0  | 0  |     |    |    |    |    |

Symmetric Lambda Value = 0.21053

Direction of Relationship = Easy to Handle  
High Attractiveness  
(+HE/+AT)

TABLE 21

Handling Ease (HE) by Attractiveness (AT)

"Yes" Responses for Acceptability in Garments (+AC)

( Crosstabulations with 'significant' lambda values.)

21.3 - Handling Ease (Snaps) by Attractiveness (Snaps)  
among those responding "Yes" to Acceptability of Snaps in a Blouse.

## Attractiveness - Snaps

|                           |      | High |    |    |    |    | Low |    |    |    |    |
|---------------------------|------|------|----|----|----|----|-----|----|----|----|----|
|                           |      | 1.   | 2. | 3. | 4. | 5. | 1.  | 2. | 3. | 4. | 5. |
| Handling<br>Ease<br>Snaps | Easy | 1.   | 2  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  |
|                           |      | 2.   | 2  | 1  | 1  | 0  | 0   | 0  | 0  | 0  | 0  |
|                           |      | 3.   | 0  | 1  | 2  | 0  | 0   | 0  | 0  | 0  | 0  |
|                           |      | 4.   | 0  | 2  | 0  | 0  | 0   | 0  | 2  | 0  | 0  |
|                           | Hard | 5.   | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  |

Symmetric Lambda Value = 0.44444

Direction of Relationship = Easy to Handle  
High Attractiveness  
(+HE/+AT)

TABLE 21

Handling Ease (HE) by Attractiveness (AT)

"Yes" Responses for Acceptability in Garments (+AC)

( Crosstabulations with 'significant' lambda values.)

21.4 - Handling Ease (Snaps) by Attractiveness (Snaps)  
among those responding "Yes" to Acceptability of Snaps in a Vest.

## Attractiveness - Snaps

|                           |         | High |    | Low |    |    |
|---------------------------|---------|------|----|-----|----|----|
|                           |         | 1.   | 2. | 3.  | 4. | 5. |
| Handling<br>Ease<br>Snaps | Easy 1. | 2    | 0  | 0   | 0  | 0  |
|                           | 2.      | 2    | 1  | 1   | 0  | 0  |
|                           | 3.      | 0    | 1  | 3   | 3  | 1  |
|                           | 4.      | 0    | 2  | 0   | 0  | 3  |
|                           | Hard 5. | 0    | 0  | 0   | 0  | 0  |

Symmetric Lambda Value = 0.42308

Direction of Relationship = Easy to Handle  
High Attractiveness  
(+HE/+AT)

TABLE 21

Handling Ease (HE) by Attractiveness (AT)

"Yes" Responses for Acceptability in Garments (+AC)

( Crosstabulations with 'significant' lambda values.)

21.5 - Handling Ease (Snaps) by Attractiveness (Snaps)  
among those responding "Yes" to Acceptability of Snaps in a Jacket.

|                           |         | Attractiveness - Snaps |    |     |    |    |
|---------------------------|---------|------------------------|----|-----|----|----|
|                           |         | High                   |    | Low |    |    |
|                           |         | 1.                     | 2. | 3.  | 4. | 5. |
| Handling<br>Ease<br>Snaps | Easy 1. | 2                      | 0  | 1   | 0  | 0  |
|                           | 2.      | 1                      | 0  | 1   | 0  | 0  |
|                           | 3.      | 0                      | 0  | 3   | 0  | 0  |
|                           | 4.      | 0                      | 2  | 0   | 0  | 2  |
|                           | Hard 5. | 0                      | 0  | 0   | 0  | 0  |

Symmetric Lambda Value = 0.53333

Direction of Relationship = Easy to Handle  
High Attractiveness  
(+HE/+AT)

TABLE 21

Handling Ease (HE) by Attractiveness (AT)

"Yes" Responses for Acceptability in Garments (+AC)

( Crosstabulations with 'significant' lambda values.)

21.6 - Handling Ease (Snaps) by Attractiveness (Snaps)  
among those responding "Yes" to Acceptability of Snaps in a Dress.

|                           |         | Attractiveness - Snaps |    |    |     |    |
|---------------------------|---------|------------------------|----|----|-----|----|
|                           |         | High                   |    |    | Low |    |
|                           |         | 1.                     | 2. | 3. | 4.  | 5. |
| Handling<br>Ease<br>Snaps | Easy 1. | 1                      | 0  | 1  | 0   | 0  |
|                           | 2.      | 1                      | 0  | 1  | 0   | 0  |
|                           | 3.      | 0                      | 0  | 2  | 1   | 0  |
|                           | 4.      | 0                      | 2  | 0  | 0   | 1  |
|                           | Hard 5. | 0                      | 0  | 0  | 0   | 0  |

Symmetric Lambda Value = 0.46154

Direction of Relationship = Easy to Handle  
High Attractiveness  
(+HE/+AT)

TABLE 22

Handling Ease (HE) by Attractiveness (AT)

"No" Responses for Acceptability in Garments (-AC)

( Crosstabulations with 'significant' lambda values.)

22.1 - Handling Ease (Zipper) by Attractiveness (Zipper)  
among those responding "No" to Acceptability of Zipper in a Blouse.

## Attractiveness - Zipper

|                            |         | High |    |    |    |    | Low |    |    |    |    |
|----------------------------|---------|------|----|----|----|----|-----|----|----|----|----|
|                            |         | 1.   | 2. | 3. | 4. | 5. | 1.  | 2. | 3. | 4. | 5. |
| Handling<br>Ease<br>Zipper | Easy 1. | 2    | 4  | 0  | 0  | 0  |     |    |    |    |    |
|                            | 2.      | 0    | 1  | 3  | 1  | 1  |     |    |    |    |    |
|                            | 3.      | 0    | 0  | 1  | 1  | 1  |     |    |    |    |    |
|                            | 4.      | 0    | 1  | 0  | 0  | 0  |     |    |    |    |    |
|                            | Hard 5. | 1    | 1  | 0  | 0  | 0  |     |    |    |    |    |

Symmetric Lambda Value = 0.34783

Direction of Relationship = Easy to Handle  
High Attractiveness  
(+HE/+AT)

TABLE 22

Handling Ease (HE) by Attractiveness (AT)

"No" Responses for Acceptability in Garments (-AC)

(Crosstabulations with 'significant' lambda values.)

22.2 - Handling Ease (Zipper) by Attractiveness (Zipper)  
among those responding "No" to Acceptability of Zipper in a Jacket.

|                            |         | Attractiveness - Zipper |    |     |    |    |
|----------------------------|---------|-------------------------|----|-----|----|----|
|                            |         | High                    |    | Low |    |    |
|                            |         | 1.                      | 2. | 3.  | 4. | 5. |
| Handling<br>Ease<br>Zipper | Easy 1. | 4                       | 1  | 0   | 0  | 1  |
|                            | 2.      | 0                       | 2  | 3   | 0  | 1  |
|                            | 3.      | 1                       | 0  | 1   | 1  | 1  |
|                            | 4.      | 0                       | 1  | 0   | 0  | 0  |
|                            | Hard 5. | 0                       | 0  | 0   | 0  | 1  |

Symmetric Lambda Value = 0.40000

Direction of Relationship = Easy to Handle  
High Attractiveness  
(+HE/+AT)

TABLE 22

Handling Ease (HE) by Attractiveness (AT)

"No" Responses for Acceptability in Garments (-AC)

( Crosstabulations with 'significant' lambda values.)

22.3 - Handling Ease (Zipper) by Attractiveness (Zipper)  
among those responding "No" to Acceptability of Zipper in a Dress.

|                            |         | Attractiveness - Zipper |    |     |    |    |
|----------------------------|---------|-------------------------|----|-----|----|----|
|                            |         | High                    |    | Low |    |    |
|                            |         | 1.                      | 2. | 3.  | 4. | 5. |
| Handling<br>Ease<br>Zipper | Easy 1. | 1                       | 1  | 0   | 0  | 1  |
|                            | 2.      | 0                       | 1  | 0   | 1  | 1  |
|                            | 3.      | 0                       | 0  | 1   | 1  | 1  |
|                            | 4.      | 0                       | 0  | 0   | 0  | 0  |
|                            | Hard 5. | 0                       | 1  | 0   | 0  | 0  |

Symmetric Lambda Value = 0.21429

Direction of Relationship = Easy to Handle  
Low Attractiveness  
(+HE/-AT)

TABLE 22

Handling Ease (HE) by Attractiveness (AT)

"No" Responses for Acceptability in Garments (-AC)

( Crosstabulations with 'significant' lambda values.)

22.4 - Handling Ease (Velcro) by Attractiveness (Velcro)  
among those responding "No" to Acceptability of Velcro in a Vest.

|                            |         | Attractiveness - Velcro |    |     |    |    |
|----------------------------|---------|-------------------------|----|-----|----|----|
|                            |         | High                    |    | Low |    |    |
|                            |         | 1.                      | 2. | 3.  | 4. | 5. |
| Handling<br>Ease<br>Velcro | Easy 1. | 1                       | 0  | 2   | 1  | 1  |
|                            | 2.      | 1                       | 3  | 1   | 2  | 1  |
|                            | 3.      | 0                       | 1  | 2   | 0  | 0  |
|                            | 4.      | 0                       | 0  | 1   | 0  | 0  |
|                            | Hard 5. | 0                       | 0  | 0   | 0  | 0  |

Symmetric Lambda Value = 0.15000

Direction of Relationship = Easy to Handle  
Low Attractiveness  
(+HE/-AT)

TABLE 22

Handling Ease (HE) by Attractiveness (AT)

"No" Responses for Acceptability in Garments (-AC)

(Crosstabulations with 'significant' lambda values.)

22.5 - Handling Ease (Velcro) by Attractiveness (Velcro)  
among those responding "No" to Acceptability of Velcro in a Jacket.

## Attractiveness - Velcro

|                            |         | High |    | Low |    |    |
|----------------------------|---------|------|----|-----|----|----|
|                            |         | 1.   | 2. | 3.  | 4. | 5. |
| Handling<br>Ease<br>Velcro | Easy 1. | 4    | 0  | 4   | 2  | 0  |
|                            | 2.      | 1    | 1  | 1   | 2  | 3  |
|                            | 3.      | 0    | 1  | 2   | 0  | 0  |
|                            | 4.      | 0    | 0  | 1   | 0  | 0  |
|                            | Hard 5. | 0    | 0  | 0   | 0  | 0  |

Symmetric Lambda Value = 0.23077

Direction of Relationship = Easy to Handle  
Low Attractiveness  
(+HE/-AT)

TABLE 22

Handling Ease (HE) by Attractiveness (AT)

"No" Responses for Acceptability in Garments (-AC)

( Crosstabulations with 'significant' lambda values.)

22.6 - Handling Ease (Velcro) by Attractiveness (Velcro)  
among those responding "No" to Acceptability of Velcro in a Coat.

## Attractiveness - Velcro

|                            |         | Attractiveness - Velcro |    |     |    |    |
|----------------------------|---------|-------------------------|----|-----|----|----|
|                            |         | High                    |    | Low |    |    |
|                            |         | 1.                      | 2. | 3.  | 4. | 5. |
| Handling<br>Ease<br>Velcro | Easy 1. | 1                       | 1  | 4   | 2  | 1  |
|                            | 2.      | 2                       | 3  | 1   | 2  | 3  |
|                            | 3.      | 0                       | 1  | 2   | 0  | 0  |
|                            | 4.      | 0                       | 0  | 1   | 0  | 0  |
|                            | Hard 5. | 0                       | 0  | 0   | 0  | 0  |

Symmetric Lambda Value = 0.17241

Direction of Relationship = Easy to Handle  
Low Attractiveness  
(+HE/-AT)

TABLE 22

Handling Ease (HE) by Attractiveness (AT)

"No" Responses for Acceptability in Garments (-AC)

( Crosstabulations with 'significant' lambda values.)

22.7 - Handling Ease (Snaps) by Attractiveness (Snaps)  
among those responding "No" to Acceptability of Snaps in a Dress.

## Attractiveness - Snaps

|                           |         | High |    |    |    |    | Low |  |  |  |  |
|---------------------------|---------|------|----|----|----|----|-----|--|--|--|--|
|                           |         | 1.   | 2. | 3. | 4. | 5. |     |  |  |  |  |
| Handling<br>Ease<br>Snaps | Easy 1. | 1    | 0  | 0  | 0  | 0  |     |  |  |  |  |
|                           | 2.      | 0    | 1  | 0  | 1  | 1  |     |  |  |  |  |
|                           | 3.      | 0    | 1  | 0  | 3  | 0  |     |  |  |  |  |
|                           | 4.      | 0    | 0  | 0  | 1  | 5  |     |  |  |  |  |
|                           | Hard 5. | 0    | 2  | 2  | 3  | 12 |     |  |  |  |  |

Symmetric Lambda Value = 0.17241

Direction of Relationship = Hard to Handle  
Low Attractiveness  
(-HE/-AT)