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Applied Ergonomics 35 (2004) 243–251

APPLIED ERGONOMICS

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An ergonomic garment design for elderly Turkish men

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Received 21 November 2002; accepted 25 February 2004

Abstract

This paper presents an ergonomic garment design for elderly Turkish men. The purpose of this study was to determine elderly men's demands, needs and problems in regard to clothing and to design an ergonomic garment in the light of this knowledge. The sample consisted of 120 elderly men living in Ankara, the capital city of Turkey, and its province. A questionnaire was prepared and given to these people in order to determine their clothing demands and needs. It was established that most of our subjects need functional garments. An ergonomic garment has been designed using the obtained data. It was found that the design of clothing for the elderly requires attention to bodily changes from aging in order to facilitate and raise the quality of life. Specific suggestions are made to elderly people and to the ready-to-wear sector.

Keywords: Elderly garment; Ergonomic garment design; Elderly consumer; Clothing

1. Introduction

The aging of the world population, that is, the increase in the ratio of the elderly in the population, has led to an increase of interest in old age generally. The number of people above the age of 60 was 370,000,000 in 1980, but it is estimated that it will be 1,100,000,000 and 1 in 7 people will be older than 60 by 2025 (Meeks, 1994). At the World Old Age Summit in Madrid in the year 2002, it was suggested that there will be more people in the world over 60 than under 15 by the year 2050 (Anonymous, 2002).

Turkey, as a developing country, has experienced a considerable increase in the number of elderly people. The number of people over the age of 60 was 1.8 million in the year 1960, and reached 4 million in the year 1990. It exceeded 5 million in 1995 (Anonymous, 1993, 1995). According to 1995 data, average life expectancy has reached 68 years in general: 70 years for women, 66 years for men.

Aging, a natural phenomenon in human life, is a normal process causing changes in a person's physiology, mental ability and social relations (Thoren, 1996). We should emphasize that this process causes problems resulting from changes in body systems, as well as socio-cultural and economic problems.

Clothing, an important issue throughout human life, plays an even more important role in the life of members of particular consumer groups. The elderly population is one of these groups, due to physical and social changes. Clothing, one of the basic physiologic needs, provides social status as well as providing comfort and protecting the body from external unwanted influences. Clothes give a richness to a person's appearance from both the physical and emotional point of view (Chowdhary, 1991). Clothing is even more important in old age because elderly people want to set up new social connections, create an image and, especially, hide the imperfections that result from the physical changes caused by old age. Some factors—physical changes in the body and the available styles to meet their needs, affect their preferences and behaviours in the area of clothing consumption (Dinkins, 1993).

In the light of this knowledge, and taking into consideration the prolonging of human life, it is certain that the clothing issue will affect more and more elderly people and it is equally certain that elderly people will gradually create a bigger and wider market.

Degenerative changes take place during old age. Changes happen at differing rates. One of these changes is the diminishing of cartilage elasticity. Muscle atrophy

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0003-6870/$ - see front matter © 2004 Elsevier Ltd. All rights reserved.
doi:10.1016/j.apergo.2004.02.001

is the most recognised symptom of old age. While the water ratio of a baby's body is 80%, it diminishes to 50–60% during old age. After 65 years of age, motor functions diminish noticeably, and sensitivity to external stimulations decreases. Corruptions occur at the tips of the bones, and some changes occur at the joints. This kind of alteration causes traumatic effects and mobility difficulties. Moreover, the balance and timing of the movement and the body posture worsens. In particular some movements, such as body flexion and rotation, become difficult (Hogge et al., 1988). Weakening of the reflexes and slackness of the neck muscles decrease productivity. Elderly people are affected not only by the weakening of nerve–muscle coordination, but also by changes in general body appearance.

In the light of the above, it can be said that anatomic, physiologic, pathologic, psychologic and social dimensions of changing due to old age affect clothing requirements (Park, 1989).

1.1. Anatomical changes

Anthropometric investigations aimed at determining anatomical changes in the body and their results determine the measurements of garments to be used in old age and are effective in matching a garment to the body (Rosenblad-Wallin and Karlsson, 1986).

Degeneration occurs in the vertebral column and the discs, body posture becomes bent forward, body height decreases because of changes in the discs and the water loss which occurs in the cartilage tissue of the vertebra during old age. Body height begins to decrease after 50 years, and continues to decrease by 2.5 cm every 5 years. After 75 years of age, the decrease reaches 5 cm every 5 years. Furthermore, shoulders become more narrow and the pelvis clearly widens. With aging, some changes occur in the shape of the chest. The ratio between chest width and depth diminishes and shoulders drop from the neck-line, so the sleevehole widens more than normal. A difference between front and back length occurs because of this body flexion. Comparative analyses with other populations indicate significant differences in the body dimensions (Kathiyal and Tettey, 2000).

1.2. Physiologic and pathologic changes

Physiologic and pathologic changes in old age also affect clothing requirements. Physical movements become more sluggish, muscle movements slow down, motor ability decreases and the number of movements needed to do a job increase (Kalinkara, 2001). Since balance disorders and dizziness are common problems in old age, it is necessary to design a garment which can be put on easily in a sitting position and where the back part, sleeves and sleevehole are wide.

1.3. Psychologic changes

The psychological aspects of the changes in old age are also very important. Psychologic health is a comprehensive term including psychologic comfort and discomfort, self-confidence and mental health. Appearance is very important from the point of view of the self-esteem and confidence of elderly people (Kaiser, 1983; Huck and Bunhotal, 1997). Psychologic disorders may occur if they experience shyness, timidity, discomfort or unease due to finding their clothes different from other people's.

1.4. Social changes

Experiencing the loss of social roles due to aging is inevitable. The individual can receive messages from his or her surrounding that he/she is old, and those messages can negatively affect his communication with his social environment. Clothing has a very important role to play in enabling an individual to live in peace both with him/herself and with other people, and, moreover, in solving the social adaptation problem. As part of their outer appearance, people can utilise clothing as a way of presenting a socially acceptable image.

Therefore, it is apparent that ergonomic garments are necessary for elderly individuals. The aim of this investigation is to develop an ergonomic garment design through determining the clothing problems of men older than 65 years. A questionnaire has been prepared and given to elderly men in order to determine their demands, needs and problems in the area. An ergonomic garment design has been prepared in the light of the information obtained.

2. Methodology

2.1. Determining the population of the study

This study is based on a randomly chosen sample of 120 men older than 65 years, living alone in retirement homes in the Ankara municipal area. Individuals who were living in a nursing home or hospital were not included. This sample was chosen because these men have to carry out daily activities by themselves without any help.

Data collection started in January 2000. The sample was determined through the municipality information system. Volunteer individuals were chosen and contacted by June 2001.

2.2. Interview programme

The purpose of this study was to determine the demands, needs and problems in regard to the clothing

of men over 65 years and to carry out clothing designs having optimal functional characteristics. A questionnaire form was prepared for this purpose. A literature review was undertaken and the information obtained was evaluated before the questionnaire was prepared. A preliminary observation was carried out with 12 men chosen from our sample to determine the questions for the questionnaire. The questionnaire was prepared in the light of this information. Then the questionnaire form was given to these 12 men. Necessary modifications were undertaken, and the final questionnaire was constructed (Appendix A Questionnaire).

This form has two parts. The first part focuses on general information regarding the person. The second part aims to determine changes in the body due to old age and their effects on garment preference, and the person's demands and needs.

2.3. Evaluating the data and the design process

The "SPSS 10.0 for Windows" software programme was used to determine the frequency distribution of the data.

The process of determining the garment features fully took into consideration the physical changes resulting from old age as well as the findings obtained regarding individual requirements and needs in clothing choice. This information was grouped according to functional and psycho-social values in order to provide an optimally functional clothing design. In the light of these values, a garment design having optimal functional characteristics was prepared. Firstly, model, fabric, pattern, and associated material features of this design were determined. Then, an example of the final product was prepared.

3. Results

3.1. Demographics

The demographic characteristics of the individuals are as follows [(number of subjects)/% of the subject].

The age of subjects: (74) 61.7% between 65 and 70 years, (32) 26.7% between 71 and 75, (10) 8.3% between 76 and 80, and (4) 3.3% of them over 81.

Weight; (27) 22.5% lower than 60 kg, (41) 34.2% between 61 and 70, (33) 27.5% between 71 and 80, and (19) 15.8% more than 81.

Income: (22) 18.2% less than 50$, (47) 39.3% between 51 and 110$, (27) 22.5% between 111 and 160$ and (24) 20% more than 161$ per month. Most of the subjects did not have sufficient income to cover their living and other expenses.

3.2. Structural alterations in the body

The structural alterations in the individuals' bodies are presented in Table 1. About 80% of the individuals have a variety of physical disorders that can affect garment design. Apart from this, they have difficulty when moving their arms and legs. This kind of problem will directly affect the design of a garment for them (Table 1).

3.3. Demands, needs and problems relating to garments

The data regarding elderly individuals' demands, needs and problems relating to garments are presented in Table 2.

This suggests that elderly individuals take a lot of time when dressing and undressing, that they find the price of clothes high and wear their clothes until they wear out. Most of them have reported problems while dressing and undressing. A considerable percentage of them need special garments and wanted the special garment, in particular, to facilitate access to the toilet and daily cleaning activities. It can be seen that most of elderly men prefer natural fabrics. And lastly, a considerable number of them were looking for servicability, and then economy when choosing a garment (Table 2).

3.4. Garment design features

In line with the data collected in the research and with conceptual information, the aims of developing garment forms for the elderly have been categorised into two

Table 1
Structural body features of elderly people

	Categories	*f*	%
Physical alterations	Weight changes	47	39.2
	Height decreases	35	29.1
	Bone deformation	26	21.7
	All of these	12	10.0
	Total	120	100.0
Movement limitations	Using arms	36	30.0
	Using legs	46	38.3
	Using fingers	14	11.7
	Healthy	24	20.0
	Total	120	100.0
Disorders affecting dressing and undressing	Muscle disorder	23	19.2
	Joint disorder	49	40.8
	Neurologic disorder	16	13.3
	Healthy	32	26.7
	Total	120	100.0

$n = 120$

Table 2
Demands, needs and problems related to garments for elderly men

	Categories	*f*	%
Period of use	Becomes worn out	83	69.2
	Getting bored	27	22.5
	Being out of fashion	10	8.3
	Total	120	100.0
Time worn	5–7 min	25	20.8
	8–10 min	44	36.7
	11–13 min	27	22.5
	More than 14 min	24	20.0
	Total	120	100.0
Evaluating the costs	Cheap	5	4.2
	Normal	40	33.3
	Expensive	60	50.0
	Very expensive	15	12.5
	Total	120	100.0
Wearing style preference	Trousers and shirt	73	60.8
	Sports wear	47	39.2
	Total	120	100.0
Need for help while dressing	Some of their garments	31	25.8
	All of their garments	31	25.8
	No need	58	48.4
	Total	120	100.0
Needing special garments	Needs	73	60.8
	No needs	47	39.2
	Total	120	100.0
Need for their garments to facilitate daily activities	Eating	11	9.2
	Toilet	55	45.8
	Daily cleaning	47	39.2
	All of their needs	7	5.8
	Total	120	100.0
Obtaining garments	Using ready-to-wear garment after alterations	56	46.7
	Ordering bespoke garments	19	15.8
	Sometimes ready-to-wear, sometimes bespoke	45	37.5
	Total	120	100.0
Fabric preferences	Natural	82	68.3
	Synthetic	5	4.2
	Either	33	27.5
	Total	120	100.0
Problems related to garments	Bad fit/wrong size	51	42.5
	Unsuitable styles	26	21.7
	Price	43	35.8
	Total	120	100.0
Features when choosing the garment	Fit	20	16.7
	Servicability	64	53.3
	Price	32	26.7
	Fashion	4	3.3
	Total	120	100.0
Problems when using garments	Difficulty when dressing and undressing	49	40.8
	Cleaning	27	22.5
	Toilet	32	26.7
	General use	12	10.0
	Total	120	100.0

$n = 120$

Table 3
Criteria which should be taken into consideration while designing an ergonomic garment for elderly people

Functional values	Psycho-social values
Providing movement facility	His/her status
Providing range of motion	Providing self-esteem
Facilitating treatment and care	Providing self-confidence
Increasing degree of independence	
Lightness	
Bodily convenience	
Providing protection from heat	
Providing air circulation	
Diminishing the pressure on the body	
Diminishing the friction on the body	
Increasing endurance	
Decreasing static electricity	

groups: functional and psycho-sociological values, as seen in Table 3.

Functional values cover anatomical and psychological situations which mainly comprise protection and relaxation. Along with functional values, psycho-sociological values should be taken into consideration, as well for designs inclined towards the elderly individual (Table 3).

First of all, the data regarding all aspects of the body, user movement, user garment needs and requirements were established. To attain the objectives, first, possible solutions were put forward based on an analysis of potential users' objective and subjective problems as seen in Table 4.

The garment design stage was achieved through the data obtained from the questionnaire form completed by men older than 65 years and in the light of information given above (Tables 1–4).

Model selection was done on the basis of the data obtained from the investigation. A casual suit was designed consisting of an upper and a lower part which would allow elderly people to move comfortably while also taking into consideration aesthetic appearance. Usability was however the highest priority (Fig. 1).

Table 4
Garment problems and solutions for elderly individuals

Problems	Solutions
Older age	Physiologically and anatomically convenient design
Low income	Lower cost
Staying at home for a long time	Convenient design for home environment
Inappropriate garment opening method	Whole front opening
Muscle and joint disorders	Choosing a simple fastening that needs less force Minimum number of fastener
Difficulty in dressing and undressing	Design facilitates dressing
Spending a lot of time while dressing	Garment design requiring less time for dressing
Inappropriate fabric features	Air permeable and natural fabric
Long periods of use	Enduring and stain-resistant fabric
Difficulty in moving limbs	Light fabric
Difficulty in using the toilet	Convenient design for toilet use

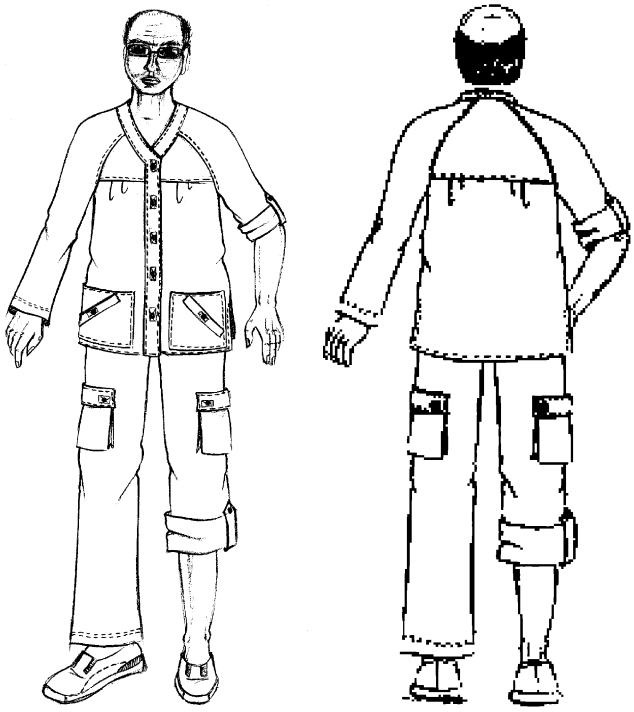

Fig. 1. Ergonomic garment design suitable for elderly men's body features.

This two-part model was designed with elderly men's body charcteristics in mind. The collar of the upper part was designed as a V and made from lycra-cotton fabric.

To facilitate comfortable movement and to widen angulation of the arms, a raglan sleeve was made with a tape to adjust arm length. This tape meant that it would be easier for elderly people to wash their hands and eat.

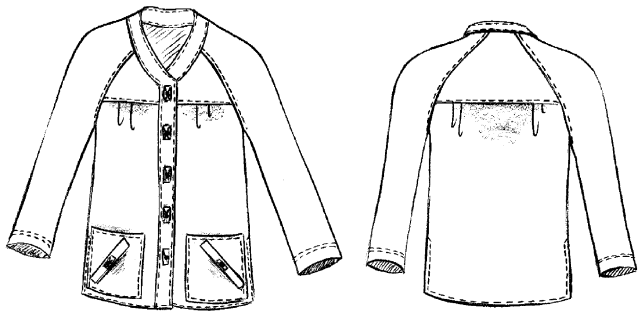

Fig. 2. Details of the upper part of the garment.

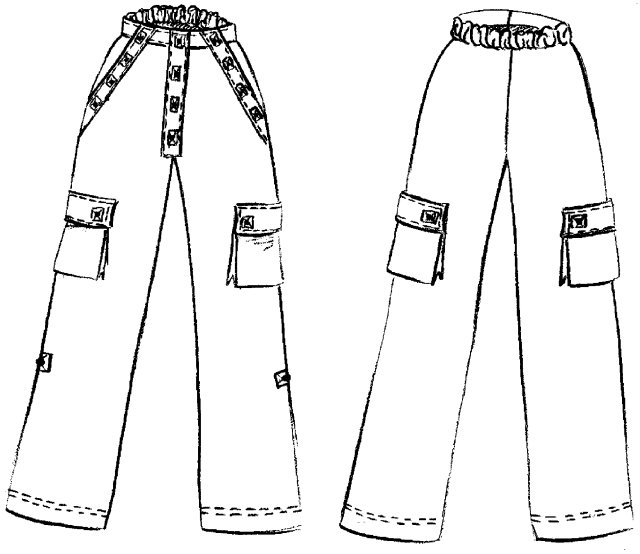

Fig. 3. Details of the lower part of the garment.

The middle front of this garment was designed to open to facilitate dressing and undressing. Velcro fasteners were used. Thin, light buttons, in contrastive colours to the fabric, were used to make it easier to see them.

In addition, full bodied garment pleats and yokes were used to prevent size fallen. Pockets were designed diagonally for functionality through the sides to take account of the angle of hand access. For comfort, short slits were made at both the right and the left lower sides of the top garment. Upper arms and sides were made seamless to diminish seam discomfort (Fig. 2).

To provide comfort, soft elastic was used at the back of the waist of the lower garment, and the waist was finished with a belt at the front. A velcro band was used instead of a zipper for ease of use. Opening the length of the band was made at the sides of the trousers to enable easy dressing and undressing. Full, easy access pockets were designed at the front near the side for functionality. The lower parts of the trousers were made length adjustable in the same way as the sleeves. A woven cotton material was chosen for the product. Colours which do not show the dirt were chosen (Fig. 3).

4. Discussion

Developments and changes in economic and social structure lead to the production of ready-to-wear garments having a lot of special characteristics. Every year a higher percentage of people are buying these products. How, it is undeniable that consumers encounter a number of problems. Some of the most important problems are: inadequate quality and the non-availability of certain styles and sizes. To solve these problems, it is necessary to determine both functional suitability and the importance of human needs.

Garment design, in particular with people having normal body measurements in mind, has been developed by companies in the ready-to-wear sector. However, elderly people's needs and garment-related problems have not been taken into consideration. From now on, their problems and needs should be taken into consideration because the elderly population has been gradually increasing.

Ready-to-wear garment companies can offer new products meeting the needs of this community by taking into consideration their clothing problems. To achieve this, it is necessary to determine some goals. In particular, ease of use and problem solving should be at the forefront of the study.

It is necessary to understand elderly people's movements and static positions well in order to facilitate movement by functional garments (Eggleston et al., 1994). A full understanding of how the body curves in different positions, the angular movements of the joints and the way the outer lines of the body change can make it easier to design a garment that is appropriate to purpose and environment.

Most elderly people cannot hold their hands above their heads (Hogge and Baer, 1986). Therefore, it is thought that garments with front buttons or openings at the back can be more accessible than those which are put on over the head from the point of view of servicability and health.

A wide armhole can facilitate comfortable movement for this garment designed for elderly people, due to the sloping of the shoulders during old age.

Elderly people have difficulty while bending down (Schwarz, 1998). Therefore, the lower parts of lower garments should be designed to be easily wearable and also fully equipped with assisting devices. To put on the lower garment easily, the opening has been kept wide. Furthermore, this wide opening provides comfort while using the toilet.

To secure the garment, fastenings such as button loops have an advantage in that their more simple functionality and lower levels of force in closing facilitate use by elderly people. Furthermore, the type, number, location, and time required for opening and closing of fastenings are important issues in elderly people's use of a garment (Huck and Bunhotal, 1997). To provide such functional simplicity, velcro has been used for the fastenings.

Movement limitations and pain cause a decrease in elderly people's movement. They prefer to rest mostly either sitting or lying down (Siu and Fan, 1990). Therefore, garments which are appropriate to a sitting or lying position can provide comfort. Garments should be designed for easy dressing and undressing while sitting, because elderly people may suffer from dizziness and loss of balance. Furthermore, the metabolism rate slows down and their sensitivity to thermal changes increases during old age. Moreover, skin becomes thin, dry and more sensitive (Harwood et al., 1997). Fabric selection thus becomes very important. Comfort can also be provided through the use of materials which are smooth and elastic, porous and allowing changes in temperature and the free flow of air. The garment designed has wide openings which provide ease of dressing and undressing while sitting. Moreover, it has been produced in lycra-cotton fabric so as not to irritate elderly people's sensitive skin.

Elderly people have difficulty in finding suitable garments due to the structural changes in their bodies. Furthermore, particular problems can inhibit their choice of garments and their freedom to dress as they need. This condition may lead to emotional stress and a feeling of inadequacy (Reich, 1976). Appearance and a proper fit are as important as functional issues to elderly people's self-confidence. Fabric, colours, accessories and model specialities should be chosen to please the user. To provide an aesthetic appearance, a casual sewing style has been used for this design.

If we take into consideration the economic crisis in Turkey, it is apparent that many elderly people are on low incomes. So, keeping the cost of garment design for this special consumption group as low as possible is an important matter for consideration. Lowering the costs can be achieved through serial production.

As a result, the data obtained showed that one of the most important expectations of elderly individuals was comfort and ease of use. As existing garments cannot provide sufficient comfort while involved in activities such as dressing and undressing, using the toilet and cleaning, it was concluded that a special garment design was necessary.

This investigation has been designed to determine demands, needs and problems in regard to clothing and to design an ergonomic garment. A further investigation determining if an ergonomic garment design facilitates elderly men's activities of daily living or not will be useful. Furthermore, investigations can be planned for other special consumer groups, such as people with disabilities and out of standard body sized individuals, by using the method of this investigation.

Appendix A

Questionnaire on garment demands, needs and problems of elderly Turkish men.

QUESTIONNAIRE

Name: …/…/200…
Address-phone number:
This questionnaire form has been prepared to determine the garment demands, needs and problems of elderly men. Please choose only one alternative. Thank you for your participation.

1. How old are you?
   - ( ) 65–70
   - ( ) 71–75
   - ( ) 76–80
   - ( ) More than 81
2. How many kilograms do you weigh?
   - ( ) Lower than 60 kg
   - ( ) 61–70
   - ( ) 71–80
   - ( ) More than 81
3. How many Turkish Liras do you earn monthly? (amounts changed to US Dollars after the interview)
   - ( ) Less than 50$
   - ( ) 51–110$
   - ( ) 111–160$
   - ( ) More than 160$
4. What kinds of changes have been occurred in your body structure due to aging?
   - ( ) Changes in weight
   - ( ) Shortening in height
   - ( ) Bone deformation
   - ( ) Other.....
   - ( ) All of them
5. Do you have difficulty when moving?
   - ( ) Difficulty when using arms
   - ( ) Difficulty when using legs
   - ( ) Difficulty when using fingers
   - ( ) Other.....
   - ( ) Healthy
6. Do you have any disorder affecting your dressing and undressing?
   - ( ) Muscle disorder
   - ( ) Joint disorder
   - ( ) Neurologic disorder
   - ( ) Other.....
   - ( ) Healthy
7. How long do you use your garments for?
   - ( ) Until they become worn out
   - ( ) Until I get bored
   - ( ) Until they are out of fashion
   - ( ) Other.....
8. How much time do you spend dressing and undressing?
   - ( ) 5–7 min
   - ( ) 8–10 min
   - ( ) 11–13 min
   - ( ) More than 14 min
9. What do you think about garment prices?
   - ( ) Cheap
   - ( ) Normal

() Expensive
() Very expensive

10. What kind of garments do you prefer generally?
() Trousers and shirt
() Sports wear
() Other.....
11. Do you need any help when dressing on and off?
() Some of my garments
() All of my garments
() No need
12. Do you need any special garment?
() Yes
() No
13. What kind of basic need should your clothes facilitate?
() Eating
() Using the toilet
() Daily cleaning
() Other.....
() All of my needs
14. How do you buy your clothes?
() Using ready-to-wear garments after alteration
() Ordering bespoke clothing
() Sometimes ready-to-wear, sometimes bespoke
() Other.....
15. What kind of fabric do you prefer for your garment?
() Natural
() Synthetic
() Other.....
() Any of them
16. Do you have any problem with your ready-to-wear garments?
() Doesn't fit my body size
() I find styles unsuitable
() I find prices very high
() Other.....
() No problem
17. Which features do you look for when buying a garment?
() Fit
() Servicability
() Price
() Fashion
() Other.....
18. On what issues do you have problems related to clothing?
() Difficulty when dressing and undressing
() Daily cleaning
() Using the toilet
() Using in general
() Other.....

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