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Analysis of Somatotype Using Korean Elderly Women's Anthropometric Measurement

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ABSTRACT

The purpose of this study is to provide basic information for elderly women's clothing design and to develop dress forms that can reflect the characteristics of their bodies. Three hundered twenty subjects, between the ages of 60~85, were chosen and the data were collected from anthropometric data. Principal component analysis which is one of the basic methods in factor analysis was applied to the interpretation of anthropometric data. As a result of analysis, the data are able to be decided into appropriate group.

1. INTRODUCTION

By the development of science civilization, the quality of life has improved and the average span of human's life has extended by quick advance of medicine so the aged getting larger in the world. In Korea, the rate of old people whose age is over 60 is 7.14% in 1990 and it is estimated that the rate will be 10.64% in 2000 and 17.7% in 2020. With the increasing of the old, the general concern about the old has increased too. It means the Silver business will be grown up as a new market and the clothing for old people will be getting more important so it is needed to make

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ready-made clothings which are quite fit to the old. To provide very well fit clothings in shape and function to the customers, it is necessary to grasp the feature of exact body of the people who are going to wear and classify into a couple of types.

The body shows various features by skeletal structure, muscle, especially the fat under the skin, the location where the cloth sticks to a body and a posture. Especially, an old woman is supposed to have various body character and experience the decreasing of biological function and change of her appearance by going through the aging procedure.

In this study, we are going to provide basic information about a moving body which is needed to form a upper garment for women who are over sixty. Details are as follows; First, we divide into the former period and the latter period putting the starting point is age of 70 and then shows the differences of the two groups and study the change of the body with the age. Second, we extract the factor which is forming body and provide information for making original design and torso which are considering the body of old people by materializing the body based on the factor.

2. SUBJECTS AND METHODS

2.1 Scope of the study

The object of this study are women who are over the age of 60. At first, we investigated 351 people but we analyzed data of 320 people except who hasn't got enough information and someone whose posture is not stable when she is standing so we used data from 320 people for analysis.

2.2 Equipments and Methods

The size of a body is changing by the time goes. In the item of height, 80% of the changing is happening before 10 a.m so we carried out the measurement after 10 a.m. The method of mesurement is based upon Anthropometric measurement and method by Martin and KS A 7004 (body measurement method) and KS A 7003 (body measurement term). To reduce the measurement error of the anthropometric measurements, four trained graduate students supervised the measuring and the person who was investigated by the student was wearing a capless brassiere and pants which is not pressing the body. She had to stand straight without moving.

2.3 Item of measurement

The item of measurement was referred to the Science of clothing composition and National anthropometric survey of Korea. The part of measurement was up to around the hips to make it enough to compose the upper garment so we established it as a necessary items to grasp the moving body of an old woman.

2.4 Data analysis

We divided the old age into former and latter period and we analyzed the differences classified by age and group by carrying out t-test about measuement data of the two groups. We could get factors forming the body by the principal componant analysis out of factor analysis methods.

Also we classified various body which is found to middle aged woman into a couple of characteristic body by cluster analysis. To make clear the classified types, we did analysis of variance and Duncan test about average of types of measurement items which were using in factor score and cluster analysis.

3. RESULT AND ANALYSIS

3.1 Data analyis of measurement items

By the results of the study that an old woman's body shape changes a lot around age of 70, we divide old woman into some group like 60~64, 65~69, 70~74, over 75. After analyzing the measure distribution, it was proved that there was a significant difference and we investigated the differences of special character of two groups which were divided into the former period and the latter period putting the starting point is age of 70.

If we compare the measurement data of the group of former period of old age and the group of latter period of old age, the group of latter period has

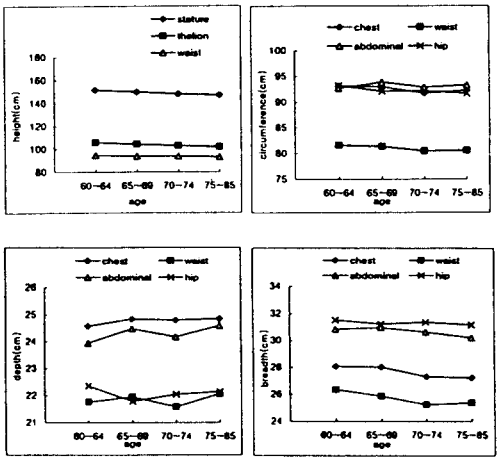

Figure 1. Tendency of anthropometric data on age group

significantly small value in the items of height. It means that length is contracting and the upper part of the body is bending when get aged. In the items of width, the group of latter period of old age has significantly small value in every items except for the width of bottom but we couldn't see significant differences in the items of circumference except for thickness items, neck root and armhole circumference.

By the result, we think the group of the latter period of old age is a bit fat comparably. In the items of length, waist front length, side neck point→B.P →waist line length, shoulder point→B.P →waist line length and side length were small value in the group of latter period of old age so we could recognized that the front length of a body is decreasing by bending of the upper part of the body as people get aged. The characteristic things of old age is that

the items of height is decreasing, shoulder is getting narrower, neck becomes thinner, the upper part of the body is bending and getting fatter.

3.2 Abstraction factor of somatotype

3.2.1 Factor component and contents

We carried out factor analysis about 59 items to grasp forming factor which are forming old woman's body. After we did final analysis, we got 7 factors from 57 items except for the abdomen length and armhole depth which the factor loading is low in the first analysis. We decided the number of factors at the point that the eigen value is not clear by Scree test. The factors were orthogonally rotated by the Varimax method.

As we see extracted 7 factors and factor loading, the items which are over 0.50 of one items are concentrated in 23 items out of 57 items cumulative variable is 66.9%, it means that 7 factors take 66.9% of information which are in all items. Table 1 shown the summrized of factors.

Table 1. Contents of factor

factor	eigen value	content
1	19.06	extent of the fatness
2	7.22	height
3	3.24	shoulder form
4	2.51	front length of upper part of the body
5	2.37	rear length of upper part of the body
6	1.94	form of chest and neck
7	1.80	form of scapular and hip

3.2.2 abstraction and contents classified by aged group

There are 3 factors out of 7 factors that significant differences were admitted about factor score classified by group after t-test and the admitted factor are factor 2 which is height factor and factor 3 which is related to shape of shoulder and factor 4 which is related to front body length. The group of former period of old age showed high factor score so we realize that the people in the group of latter period of old age have narrow shoulder and short height and bent upper part of the body. After the t-test about factor score, the two aged groups that showed significant body shape differences were analyzed about factors.

There was no differences about contents of factor abstraction and there was differences about order of items. Across back had been a factor of fatness in the former period of old age but it was shown as a factor which is relating to shoulder.

In the group of former period of old age, the shape of neck was factor 8 but it was factor 5 to the group of latter period of old age because the upper part of a body and neck are going to bend forward when people get aged. In the latter period, the slope of the shoulder was extracted as a independent variable.

Table 2. Contents of factor on age group

factor	former period group of old age	latter period group of old age
1	extent of the fatness	extent of the fatness
2	height	height
3	shoulder size and form	front length of upper part of the body
4	front length of upper part of the body	shoulder size and form
5	rear length of upper part of the body	form of neck, across chest and back
6	form of scapular and hip	scapular projection point and form
7	form of the neck	slope of the shoulder

3.3 Classification of somatotype

3.3.1 Choosing a large group of women

To make a pattern of old woman, we put the 7 factors as independent variables and carried out cluster analsis. The standard to estimate the similarity of samples is Euclidean distance measuring method and made a large group of people with hierarchical group divisible design done by least varience difference method by Ward.

The number of groups are desirable to classified into a few at the state of including many information so we finally decided the type whose differences are clear and the type whose distribution is even by increasing 3~5 by the order. The distribution of age on four types is shown in Table 3.

Table 3. Distribution of age on four types

(unit : person)

group / type	former group	latter group	total
1	45(30.6%)	37(21.4%)	82(25.6%)
2	15(10.2%)	16(9.2%)	31(9.7%)
3	53(36.1%)	64(37.0%)	117(36.6%)
4	34(23.1%)	56(32.4%)	90(28.1%)
total	147(100.0%)	173(100.0%)	320(100.0%)

3.3.2 Analsis of specific characters by types

After analysis of differences between factor score and average by types, the value of height, cervicale height and shoulder height are high but bust point height is not high. The length factor of front and back side of a body is high

and all the values of length item included in this factor is high.

The items about shoulder shape are smallest out of 4 items and side neck point→scapula projection point length, cervicale→scapula projection point, length and shoulder point→scapular projection point length are short so the scapula projection point is high.

The fatness factor was lowest so we can realize that type 1 is tall and thin body by the fact that all circumferences, width and thickness value except for across chest were so small.

Type 2 shows that the factor of chest and neck shape and the factor of scapula projection shape are high, the length factor of back side of body is low, the degree of fatness is average with average height and the scapula projection point is low.

Type 3 shows that the factor showing a shoulder shape is high and length factor of back side of body is low so the shoulder is wide and height is short. The values of height items are lowest in every items and the value of side neck point→scapula projection point→ waist line length, the length of back and shoulder point→scapular projction point →waist line length are low.

Type 4 is a body which is tall and fat because the factor of fatness and height are highest out of 4 types. The differences of value of items which are included in the length of back side are so much compared with the length of front side therefore, we recognize that the upper part of the body is bent.

4. CONCLUSION

The purpose of this study is providing some information to make torso and original design of clothing of the old. Grasping the body of the old was advanced and made specific types. The objects of this study are 320 people whose age is 60~85 and we extracted forming factors of a body by factor analysis about 57 items and we made types of a body by cluster analysis.

First, the characteristic somatotype of old women have tendency to have breast which is not elastic and fats in the part of waist and abdomen. The upper part of body is going to bend and height item is decrasing.

Second, the factors that significant differences are admitted are the items of height, shoulder shape, front length of a body. The group of former period of old age showed high factor score in those 3 items so the latter period group are short and has bent body and narrow shoulder.

Third, body styles which were classified by cluster analysis are 4 and let's see the characteristic somatotype of each style. Type 1 has the specific character like tall, thin, long upper part of a body, high scapula projection point. Type 2 has average height and low scapula projection point. Type 3 shows short height and long back side of a body compared with front side and abdomen part is located a bit forward. Type 4 shows tall and fat body and the body bent forward because the lngth of

front side is shorter than back side. 28.1% of all are in this type. In the former period, 23.1% were in this type but it changed to 32.4%, it proves the body is changing to bent body by the age.

The objects of this study are limitted in some area so it was not perfect to generalize the results. It is needed to study about posture factor with measurement data at the same time for designing well fitted clothings.

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