Analysis of Upper Torsos Replicas of Elderly Women for Bodice Pattern

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Abstract

The purpose of this study was to examine the changes brought by the upper body form using a three-dimensional human body measurement the gypsum method. The developed plane figure was constructed using paper replica to analyze the dimensional shape of the upper torso and to be able to design clothes suitable for elderly women's physical characteristics. The characteristics are analyzed and compared with existing patterns in order to extract the components for the pattern design. The examination was carried out based on the developed plane figures of upper body surface replicas. Type 1, the bent-forward body form, has a wide gap on the shoulder. In Type 2, the gap of waist line was wide at angulus scapulae point. Type 3 was the thin body form, and the girth of the chest, front interscye breadth and back interscye breadth were more level with one another, compared to the other types. In Type 4, the bent-backward body form, there was a wide gap on front shoulder. Comparison with the developed plane figure and existed pattern, items revealed differences in significance included the front and back interscye width between the measured values of the existed patterns and the developed plane figure. Therefore, the basic components of basic bodice pattern for old women were determined in the up-bust circumference and length of the back.

Key words : developed plane figure, upper torso, elderly women, draft component,
up-bust circumference

I . Introduction

In designing clothes, a thorough understanding of the form of the human body is

important. It is essential in creating a scientific pattern that accurately subscribes to the characteristics of the human body(Kim et al, 1998). As the elderly female population show a greater change and wider diversity in body shape compared to the other age groups (Hahm, 1985; Kim & Choi 1995; Nam, 1997), theres a need to create a pattern suited to their physical features.

According to the developement of functional pattern design, in measuring the bodies for eldery people, the characteristics of each body type is classified by statistical analysis(Kim, 2000; Yoo, 2000; Kim & Sohn, 1996). This classification is used as the basis for clothing design.

Meanwhile, the special features of the pattern are improved by evaluating the existing pattern, wearing and motion analysis is used to develop the new pattern(Jung, 1997). After the form of the body is cast in gypsum, it is shaped on a piece of paper. This developed plane figure is prepared to analyze the cubic figure of the human body and to reflect the result in a pattern design that can apply to people of different ages(Kim et al, 1997; Na & Jung, 2001).

However, for the aged, the form of the body changes significantly, making it difficult to select subjects. Thus, only the sleeve pattern design based on the cubic analysis of the arm(Tomita et al, 1987; Min & Kim, 1989) and the replica of the human body based on Moire Topography(Iwasa et al, 1992) can be cited, but few have analyzed the study on bodice pattern in Korea.

Against this background, the developed plane figure of the torso of a subject is prepared per type. The types are based on the classification of the body form for the Bodice Pattern design. The characteristics are analyzed and compared with existing patterns in order to calculate the components for the pattern design.

Based on this result, this paper presents the basic data for the pattern designs of clothing for aged people. The patterns are excellently suitable and adequate to the body.


II. Methods

1. Subjects

Based on the anthpometric measurement data in the pilot study, four clusters were categorized(Shin & Lee, 2001). Four subjects who represent each somatotype were selected. Each type's characteristics that resulted from cluster analysis are shown in Table 1. Type 1 women(22.7%) are the smallest in upper torso. They are short, tend to bend forward, and have chests hanging low. Type 2 women(25.8%) are shoter and moderately obese. Their upper front and back sides are shorter, and their chests hang lower. those in the type 3 category(33.8%) are the tallest. They are stout, with

broad backs and shoulders. Type 4 women(27.8%) are slightly tall, and tend to be slim, with backs bent backward.

2. Replica Method

After the form of the body is cast in gypsum(Kim H,K et al, 1997), the developed plane figure was constructed using a paper replica to analyze the dimensional shape of the torso and to reflect the result in a pattern design. Figure 1 shows the measured part of the torso in the form of a developed plane figure.
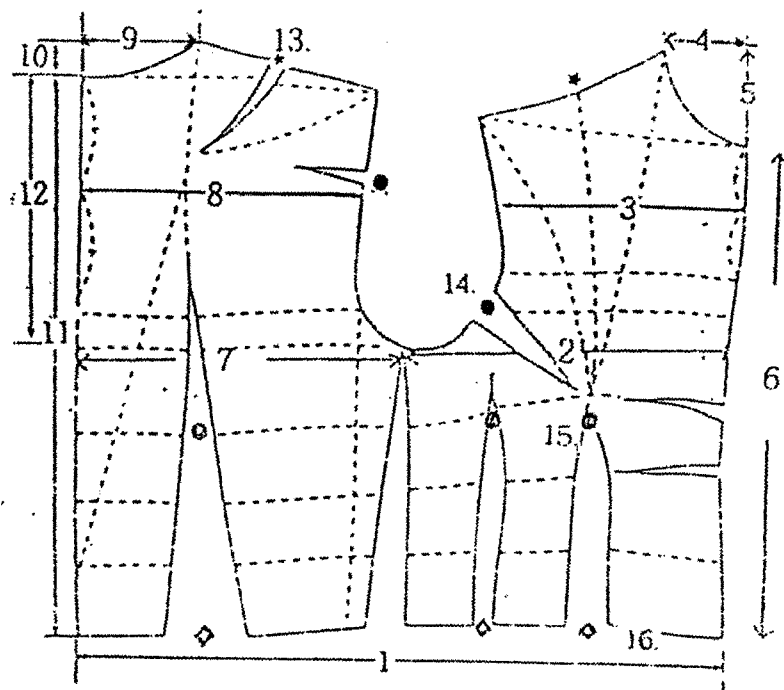
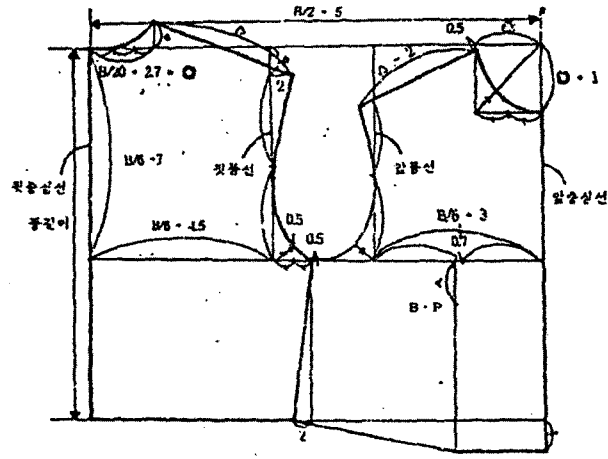|			
1.	Bust girth line /2	9.	Back neck width / 2
2.	Front bust width /2	10.	Back neck depth
3.	Front interscye width /2	11.	Back waist line
4.	Front neck width /2	12.	Armhole length
5.	Front neck depth	13.	Amounts of gap at shoulder line(★)
6.	Front waist line	14.	Amounts of gap at armhole line(●)
7.	Back bust width /2	15.	Amounts of gap at bust line(◎)
8.	Back interscye width /2	16.	Amounts of gap at waist line(◇)

<Fig.1> Items for measurement of developed plane figure
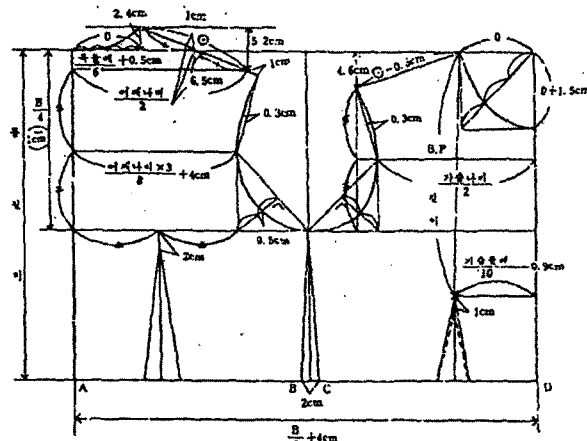
<Table 1> Physical constitution of subjects

Item	Subject	Subject I	Subject II	Subject III	Subject IV
Height	H1	146.4	145.8	153.5	149.9
	H2	125.0	123.2	128.0	127.8
	H3	118.1	115.5	122.6	122.8
	H4	91.9	89.7	93.5	96.0
	H5	107.5	106.1	113.0	113.3
	H6	97.7	97.6	104.2	106.3
	H7	98.7	94.5	101.1	105.2
Breadth	B1	11.6	10.9	11.1	10.7
	B2	30.7	28.7	32.0	31.0
	B3	19.5	20.0	21.0	19.0
	B4	23.6	27.7	25.4	24.0
	B5	24.7	26.7	28.6	24.2
	B6	24.0	25.4	25.7	23.9
	B7	25.0	24.6	25.8	23.3
Depth	D1	20.3	19.1	19.8	19.4
	D2	22.3	23.6	24.0	23.1
	D3	20.7	20.1	18.8	17.1
	D4	20.7	21.8	21.6	19.0
Girth	G1	37.5	36.5	37.0	36.0
	G2	82.0	84.0	90.5	84.0
	G3	88.0	91.0	94.0	86.0
	G4	85.0	86.0	80.0	79.0
	G5	85.0	78.0	84.0	80.0
Length	L1	16.5	16.1	16.6	17.0
	L2	11.5	10.9	12.0	11.5
	L3	28.5	26.9	28.5	25.0
	L4	36.0	35.5	38.0	36.0
	L5	29.0	28.0	34.0	27.5
	L6	34.5	34.0	40.0	36.5
	L7	31.0	33.5	37.0	29.0
	L8	36.0	36.5	39.0	35.0
	L9	37.8	36.8	39.5	36.5
	L10	35.0	38.0	36.0	30.5
	L11	38.0	38.8	43.0	38.5
	L12	39.4	40.0	46.0	36.5
	L13	15.5	17.2	19.5	16.0
	L14	15.5	16.0	16.5	14.5
Slope(°)	S1	21.0	21.0	22.0	20.0
Weight(kg)	W	53.5	50.0	55.5	46.0
characteristics		The smallest type, Somatotype is slightly bent forward	Standard physique, Somatotype is slightly bent forward	Tall and big physique , straight somatotype	Tall and thin type, Somatotype is slightly bent backward

3. Collection of the Elderly Bodice Pattern

In comparing the suitability of the pattern to the body, the value of each part of the existing pattern and developed plane figure was measured. The existing pattern design, Bun-Ka pattern(M pattern) and Pattern for the aged(L pattern)(Lim, 1999) were selected to measure the items for the pattern design. These were compared with the developed plane figure. Figure. 2 shows the drafting method for the existing pattern. Figure. 3 shows the measurements of the items for comparing the drafting method.
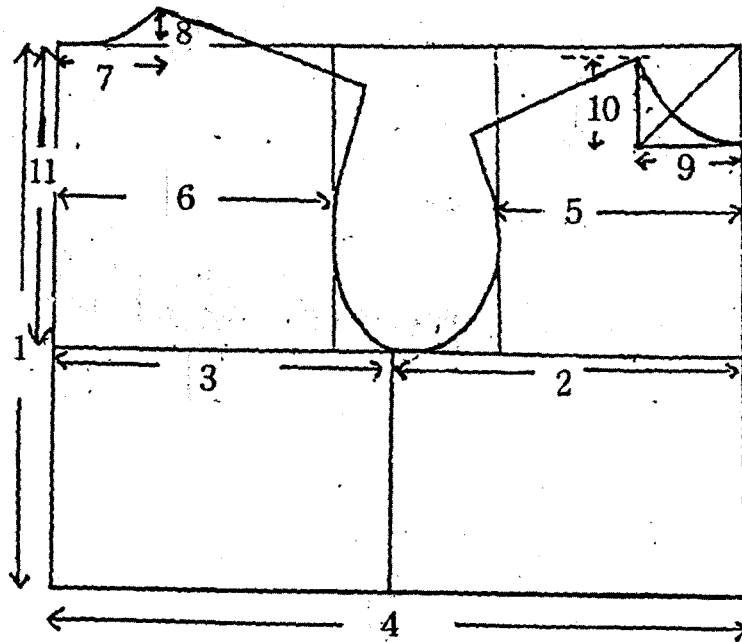

<M-pattern>

<L-pattern>

<Fig.2> The drafting method for the existing pattern.

1.   Back length
2.   Front bust width /2
3.   Back bust width /2
4.   Bust girth line /2
5.   Front interscye width /2

6.   Back interscye width /2
7.   Back neck width /2
8.   Back neck depth
9.   Front neck width /2
10. Front neck depth
11. Armhole length

<Fig.3> Items measurement for the basic bodice pattern

4. Data Analysis

1) To analyze the characteristics of the developed plane figure per body form, the descriptive statistic for length and spread volume of each part of the developed plane figure per type was obtained. The significance of the Anova and the SNK test was verified to compare difference of dimension between types.

2) The average and deviation of dimension per part of the existing pattern and the developed plane figure were obtained. Then the significance of the T-test was verified.

III. Results and Discussion

The basic pattern design for the body surface format of elderly women was prepared using gypsum method, and the developed plane figure was constructed using

a paper replica to analyze the dimensional shape of the torso. And to compare the suitability of the pattern to the body, the value of each part of the existing pattern and developed plane figure was measured.

1. Developed Plane Figures' Characteristics according to Somatotype

As a result of the developed plane figure constructed using paper replica, each type's characteristics that resulted from factor differences are shown in Figure. 4.

When the developed plane figures were constructed for each of the body types, Type 1 had smaller, coherent gaps between the center front to B.P, compared to the other types. Its back shoulder was open wide, because this type tended to be bent forward and the vertical arrangement of the back length and waist line made the shoulder gap broader. Accordingly, there is a need to increase the shoulder dart and set the dart in relations with the side-neck point for the forward-bending type. In Type 2,

Type I

Type II

Type III

Type IV

<Fig.4> Developed plane figure of each somatotype

there was little gap between the center front and BP and between the back front and angulus scapulae point, but the distance from BP, side line and angulus scapulae point to the waist was broader.

For Type 3, the developed plane figure was larger than that of the other types, with wide gaps around the waist line. This type's width of the body was big, and there were broad horizontal gaps from the center front to BP. In Type 4, there were broader gaps on the front shoulder, but the gaps of the back shoulder were less and smaller. That's because this type tended to be bent backward, hence the front side was longer than the back side and the shoulder leaned backwards.

The degree of dart could be selected according to the gap around the chest, and the extent of ease should be decided considering the body-surface length of the plane figure for pattern design.

In regard to the change of the armhole, the gap of the cutting line from armpit point to BP varied from type to type. Type 1 and 4 that had the least difference between bust girth line and lower bust-girth line were smaller in that gap, compared to Type 1 and 3.

The front side was longer than the back side when the total length of the plane figure was compared. Therefore, it seems that the fitness could be improved by making the front length longer.

2. Analysis in Gaps of the Developed Plane Figures

As a result of comparing the width of gaps, it's found that the gaps should be considered to calculate the degree of ease, as they are inevitably generated when the three-dimensional human body form is transformed into one-dimensional pattern. Table 3 presents the amounts of gap in developed plane figures according to body type classification.

In a correct posture, every baseline was generally at right angles or were level with one another, and the physical characteristics of the subjects and the difference of the body-surface form caused by different postures were identified. In the front side, the gaps were located chiefly from BP to the shoulder and to the waist line. In the back, the gaps were placed from back shoulder line to the shoulder and to the waist line. This fact is consistent with the findings of earlier studies that the gaps ranged from the top-projecting point to the outer lines.

As a result of measuring the real dimensions, there appeared a great discrepancy in front interscye breadth, back interscye breadth, the shoulder gap and the armhole gap. The forward-bending Type 1's front interscye breadth was smaller than the others', and the backward-bending Type 4 was larger in back interscye breadth than the other types. The shoulder gaps were similar, as Type 1 had broader back shoulder gaps and Type 4 had wider front shoulder gaps. The armhole gap was the least in

Type 1 since it has less difference between bust girth line and waist measurement.

<Table 2> Gaps and values of measurement in developed plain figure(unit:cm)

Item		Type	Type I	Type II	Type III	Type IV	F-value
1	Bust girth line /2		48.46 B	49.33 B	51.16 A	49.16 B	5.69*
2	Front bust width /2		24.56 C	26.26 B	28.80 A	26.26 B	32.62***
3	Front interscye width /2		16.50 B	18.13 A	18.76 A	18.76 A	27.49***
4	Front neck width /2		8.10 A	8.43 A	8.08 A	7.23 B	22.08***
5	Front neck depth		8.93 A	8.96 A	8.51 B	8.00 C	13.42**
7	Back bust width /2		23.71 A	23.00 AB	22.56 B	22.40 B	4.07*
8	Back interscye width /2		18.13 A	18.03 A	18.23 A	16.66 B	33.79***
9	Back neck width / 2		7.83 A	8.00 A	7.75 A	7.23 B	10.15**
10	Back neck depth		1.50 B	1.60 B	2.33 A	2.30 A	34.47***
11	Back center line		35.16 B	36.50 A	37.56 A	36.96 A	10.41**
12	Armhole length		22.00 A	22.80 A	22.90 A	20.76 B	9.53**
13	Amounts of gap at shoulder line	F	1.50 C	2.80 B	0.83 D	4.00 A	16.54***
		B	4.63 A	3.00 B	1.06 D	1.46 C	52.77***
14	Amounts of gap at Bust line	F	0.36 BC	0.60 A	0.53 AB	0.33 C	4.92*
		B	0.70 C	2.46 A	2.50 A	1.33 B	20.16***
15	Amounts of gap at waist line	F	2.40 C	4.86 A	4.60 A	4.03 B	78.63***
		B	0.56 D	3.36 A	2.50 C	3.00 B	24.30***
16	Amounts of gap at armhole line	F	2.03 C	3.20 B	3.51 A	1.23 D	13.72***
		B	0.00 C	0.26 B	0.76 A	0.00 C	23.51***

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$
A> B> C : Alphabet letters are significantly different by SNK test

For every type, the gap resulting from cutting was broader in the front side than in the back, and especially wider around BP.

The total gap in the waist measurement was 6.33cm, with 3.95 in the front side and 2.38cm in the back. This dimension included the cut-off side line and the amount of dart caused by the difference between the girth of the chest and the outmost girth of the trunk. Consequently, the amount of the front and back waist dart should be selected based on the gap in the waist measurement. The gap on the shoulder was 2.3cm in the front and 2.55cm in the back.

The broad gap on the shoulder seemed to result from the dissimilarity of the shape of the back between the types.

As mentioned earlier, the extent of dart and ease of the pattern for the elderly women should be determined based on their physical characteristics. Concerning the number of cutting line and gap around the waist line, it seems to be desirable to arrange two waist darts, rather than one, for an upper garment that covers the waist.

According to Jung(1986), it's better functionally and visually to locate dart at 6cm±0.6 on the right and left side from the center line. For elderly women, however,

the dart location needs to be selected based on BP location, since the drooping breasts make a big difference to BP location.

3. Comparison with the Developed Plane Figure and Existed Pattern

A comparison was made with the developed plane figure to determine the basic items of pattern design. To design the bodice pattern for old women, the existing pattern and developed plane figure were compared and analyzed. These were used to determine the basic items. Table 3 shows the comparison of measurements in conventional bodice pattern and developed-plane figure.

As a results of compare the M-pattern and developed-plane figure , items showed a significant difference in back bust width, front and back intersyce width at $p \leq .05$. And in the compare with the L-pattern and developed-plane figure, front and back neck width revealed   significantly at $p \leq .01$. Front and back intersyce width also showed a significant difference at $p \leq .05$. In a pattern design, this position should be respected characteristics of the body types.

<Table 3> Comparative measurements in bodice pattern and developed plane figure (unit:cm)

Item	Pattern	M Pattern		Developed plane figure		T-test	L Pattern		Developed plane figure		T-test
		M	(SD)	M	(SD)		M	(SD)	M	(SD)	
1	Back length	37.0	(1.7)	36.3	(1.1)	1.9	36.8	(1.4)	36.3	(1.1)	2.5
2	Front bust width/2	25.2	(0.9)	26.4	(1.3)	-1.5	24.7	(1.0)	26.4	(1.3)	-2.1
3	Back bust width/2	25.2	(0.9)	22.8	(0.7)	4.3*	24.7	(1.1)	22.8	(0.7)	2.7
4	Bust girth line/2	50.6	(1.7)	49.4	(0.9)	2.0	49.7	(1.3)	49.4	(0.9)	0.8
5	Front interscye width/2	17.4	(0.5)	16.0	(0.3)	-4.0*	16.6	(0.8)	16.0	(0.3)	-3.2*
6	Back interscye width/2	18.5	(0.5)	16.9	(1.0)	3.6*	18.1	(0.4)	16.9	(1.0)	5.0*
7	Front neck width/2	7.3	(0.2)	7.9	(0.4)	-3.0	6.6	(0.2)	7.9	(0.4)	-5.7**
8	Back neck width/2	7.5	(0.1)	7.6	(0.2)	-1.7	6.6	(0.2)	7.6	(0.2)	-5.3**
9	Front neck depth	7.9	(0.2)	8.6	(0.3)	-2.9	8.0	(0.3)	8.6	(0.3)	-2.4
10	Back neck depth	2.4	(0.1)	1.9	(0.3)	2.3	2.4	(0.0)	1.9	(0.3)	2.1
11	Armhole length	22.0	(0.5)	18.3	(1.0)	0.6	21.9	(1.0)	18.3	(1.0)	0.4

*$P \leq .05$, ** $P \leq .01$

Front and back neck width showed a significant difference between the measured values of the L-pattern and developed-plane figure. The difference was due to used the values of neck girth in L pattern draft.

Front and back interscye width revealed a significant difference between the measured values of the existed patterns and the developed plane figure. This is because most of the front and back interscye width are based on bust circumference. In old age, the breasts sag showed a bigger change, it was determined that the

adequacy between body and pattern is the problem. Therefore it is reasonable to determine the criteria for the width with respect to the bodice pattern design for old women based on the up-bust circumference. The length of the back is unaffected regardless of circumference item. Therefore, it had actual measurements.

IV. Conclusions

The purpose of this study was to examine the changes brought by the upper body form using a three-dimensional human body measurement the gypsum method. The developed plane figure was constructed using paper replica to analyze the dimensional shape of the upper torso and to be able to design clothes suitable for elderly women's physical characteristics. The characteristics are analyzed and compared with existing patterns in order to extract the components for the pattern design.

Based on this result, this study presents the basic data for the suitable and functional pattern designs of clothing for aged people.

The results were as follows:

1. The examination was carried out based on the developed plane figures of upper body surface replicas. Type 1, the bent-forward body form, has a wide gap on the shoulder. In Type 2, the gap of waist line was wide at angulus scapulae point. Type 3 was the thin body form, and the girth of the chest, front interscye breadth and back interscye breadth were more level with one another, compared to the other types. In Type 4, the bent-backward body form, there was a wide gap on front shoulder. The result shows that the differences among body types are due to body surface developments and the degree of stretching. Therefore, the amounts of dart should be carefully determined in clothing design.

2. Comparison with the developed plane figure and existed pattern, items revealed differences in significance included the front and back interscye width between the measured values of the existed patterns and the developed plane figure

3. For the basic components of basic bodice pattern for old women, the up-bust circumference and length of the back were determined.

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