A Study on the Basic Pattern of Bodice block for Adult Women in China[+]

− Focusing on Women in 20s Residing in Beijing and Shanghai −

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Abstract

The purpose of this study is to develop the appropriate bodice model for Chinese women in order to contribute to the improvement of fitness of clothing products that are exported to China.

The sample group was the subject of 149 persons with the standard body shape of 19−24 years old women who reside in Beijing and Shanghai, China. The data analysis is processed for statistics using SPSSWIN 10.0 PROGRAM, and the used analysis methods are technical statistics analysis, factor analysis, group analysis, and one-way ANOVA.

The outcome of this study is summarized as follows.

1. Prior to develop the tight-fitting shape of bodice model, the body classification approach by the posture and type of bending and stretching is selected to use 6 index items, and the body types are classified into bent body, right body, and pull-back body.

2. The average body size of standard body shape had 3 times of wearing experiment based on the tight-fitting shape of ESMOD bodice block drawing, and the system was corrected and supplemented to present the final bodice block drawing.

3. Comparisons have been made based on the center front line, center back line and chest circumference for each of existing bodice block for Chinese women, existing bodice block for Korean women and the combination of the bodice block under this study.

Key words : the standard bodice block, tight-fitting shape, standard body shape

Ⅰ. Introduction

1. Necessity of the Study

After the launching of the WTO system, the world has been evolving into the boundary-less market. The domestic clothing industry is encountered with the unlimited competition to actively respond to the changes in the global market place with the full opening of distribution market. It has been seeking to advance into the clothing market in China as 'the largest market in the 21st century' that is turning rapidly from the supplier market to purchaser market.

However, in spite of the fact that the body shape of Chinese women are fundamentally different from those of Korean women, the Korean clothing products for the body shape of Korean have been exported to China create so much problems in fitness due to the clear difference in body size that there has been much of dissatisfaction of size in purchasing the ready made clothes as well as increasing demand for repairs.

Although the Chinese market presents a great opportunity for the Korean clothing industry with its cheap and rich labor force, close geographic, social and cultural proximity, the Korean clothing makers have not responded well to the rapidly changing environment of China and failed miserably for not understanding well on the culture, market, government policy, particulars of regional and national characteristics and the consumer preference of China (Sohn, Hee-Jung·Kim, Hyo-Sook, 2000)[1]. Therefore, in order to find out the tendency of the Chinese consumers, a variety of studies have been undertaken,

including the characteristics of the Chinese clothing markets, the patterns and features of Chinese life style, the preference of clothing design of Chinese consumers, the fitness of Korean clothing for college students in China, the bodice pattern development for Chinese women and others (Sohn, Hee-Soon · Kim Ji-Yeon, 2000[2]; Jang, Hee-Kyung and Others, 1999[3]; Sohn, Hee-Soon · Wee, Hye-Jung, 2003[4]. In addition, according to the survey of Chinese body (2004) by Samsung Fashion Research Institute for expanding the export to China, the Chinese women consumers consider the quality and activeness, sense of wearing, fitness, sturdy embroidery and others as the determining factors of clothing purchase, and for the survey on the fitness of the ready made suit products, the breast and waist parts have sufficient room with the close attachment on the hip part, meaning that there is not much consideration for various size system on the fitness of clothes to show the body shapes[5][6].

Therefore, in this study, while there is very insufficient information available in terms of body shape, clothes size, pattern and others of Chinese women, we measured and analyzed the upper body parts on Chinese women in 19-24 years of age who are highly sensitive to the fitness of clothes, and the body types are classified into each pattern, and the relationship of these groups is compared to develop more functional and higher bodice block of the bodily suitability to provide the base data for clothing design for clothing companies that wish to advance to China with the strategy of high class women's clothing.

2. Purpose and Contents of the Study

The purpose of this study was to implement the measurement of human body for Chinese women in 19-24 years of age who reside in Beijing and Shanghai for the development of patterns and classification of the upper body types to formulate the right body, and develop the bodice block that fits into the body type to provide the bodily suitability for the domestic clothing related companies that wish to advance to China.

1) The upper body shapes of 19-24 years of Chinese women are classified into the index category and the body measurement figure for each body shape (bent body · right body · pull-back body) is compared and analyzed to clarify the characteristics.

2) From the 3 body types, the research pattern is formulated to follow the drawing method of France ESMOD-type bodice block[7] with tight-fitting shape based on the body measurement figure of the right body.

3) By undertaking the wearing experiment to correct and supplement, the final standard sizes and the tight-fitting shape bodice block are presented.

4) By comparing the bodice block developed for Chinese women and the existing bodice block for Chinese women, the differences are contemplated.

5) By comparing the bodice block developed for Chinese women and the existing bodice block for Korean women, the differences are contemplated.

II. Method of Research and Procedure

1. Measurement of Body

1) Measurement period and subject

This study measured for 1,381 women between 19 and 50 aged residing in Beijing and Shanghai, China from June 23 to August 7, 2004 by the simple random sampling. From the subject of measurement, 348 women with 19-24 years that is reached for the completion stage of body shape for the development of the standard pattern, and this sample of the research data is set with 149 subjects with the right body 〈Table 1〉.

〈Table 1〉 Sample Design

unit : person(%)

Residential area Age	Beijing	Shanghai	Total
19-24 years of age	154(44.2)	194(55.8)	348(100.0)

2) Measurement device and method

The measurement applied the R. Martin's body measurement method, survey report of national standard body in 1997 and the standard point and line of measurement set by the 5th Korean Body Size Survey (Size Korea, 2003), and, the body measurement equipment designed by Martin is used for measurement.

The measurement method was that the subjects for measurement were in the underwear (a brassier and a brief) without movement of body. They straightened the spine and knees, held the head straight up, with arms naturally placed down in a way of having the right side for symmetric line in measurement. At this time, the both feet have the hills gathered with the tips open for 45°.

〈Table 2〉 Items of Measurements

Div.		Measuring Items	Div.		Measuring Items
Height	H1	Stature	Circum-ference	C8	Hip Circumference
	H2	Anterior Neck Height		C9	Armscye Circumference
	H3	Chest Height	Length	L1	Front Waist Length
	H4	Bust Height		L2	Neck Shoulder Point to Breast Point Length
	H5	Underbust Height			
	H6	Waist Height		L3	Neck Point to Breast Point to Waistline Length
	H7	Abdomen Height			
	H8	Lateral Neck Height		L4	Shoulder Point to Breast Point Length
	H9	Cervical Height			
	H10	Shoulder Height		L5	Shoulder Point to Breast Point to Anterior Waist Length
	H11	Hip Height			
Breadth	B1	Neck Breadth		L6	Interscye Front Length
	B2	Shoulder Breadth		L7	Bust Point-Bust Point Length
	B3	Bideltoid Breadth		L8	Cervical to Shoulder Point Length
	B4	Chest Breadth			
	B5	Bust Breadth		L9	Shoulder Length
	B6	Underbust Breadth		L10	Bishoulder Length
	B7	Waist Breadth		L11	Interscye Back Length
	B8	Abdomen Breadth		L12	Scye Length
	B9	Hip Breadth		L13	Waist Back Length
Depth	D1	Chest Depth		L14	Neck Point to Back Waistline Length
	D2	Bust Depth			
	D3	Underbust Depth			
	D4	Waist Depth		L15	Shoulder Point to Axillary Level at Midspine Length
	D5	Abdomen Depth			
	D6	Hip Depth		L16	Shoulder Point to posterior Waist Length
	D7	Armscye Depth			
Circum-ference	C1	Neck Base Circumference		L17	Waist to Hips Length
	C2	Neck Back Circumference		L18	Shoulder Point Axillary Level at UpperArm Length
	C3	Chest Circumference			
	C4	Bust Circumference			
	C5	Underbust Circumference	Angle	A1	Right Shoulder Slope
	C6	Waist Circumference		A2	Left Shoulder Slope
	C7	Abdomen Circumference	Other	WT	Weight

* The shade is required category when designing the ESMOD bodice block

3) Measurement category

The measurement categories are the categories required in finding out the upper body shape and clothing composition that have the references from the body measurement method of R. Martin and data on body measurement for clothing composition with the standard terminology published by the 5th Korean body measurement survey in 2003 (Size Korea, Korean Agency for Technology and Standards), and a total of 57 categories were measured including the height categories (11), width categories (9), thickness categories (7), surrounding categories (9), length categories (18), angle categories (2), and other categories (1). The measurement categories are shown on 〈Table 2〉.

2. Design of Bodice Block

The design for the first research pattern used the France ESMOD-style women's wear bodice block drawing method, and the categories for applied size were set for a total of 13 categories with 5 categories of circumference and 8 categories of length required for the ESMOD bodice block drawing from the total of 112 measurement categories for the body shape research.

Based on the average body size of the right body for the Chinese women in early 20s following the outcome of the body classification with the applicable size for the design of the first research bodice block, the minimal space is added for amendment and supplement.

For the circumference, it considers the waist down-outer covering circumference of the hip, 1.9cm was added for space portion. For length part, the length of Shoulder Length has cut off 0.5cm to apply 12.5cm in order to make the neck point comfortable. For waist back length, it expanded 0.6cm for insufficient size occurring from the protrusion of a shoulder blade, and since the measurement of body surface was made while the brassier is worn, the front waist length was shortened that 1.4cm was added to maintain the comfortableness. In order to make the interscye front length in more natural setting, 0.9cm was added in the length in between anterior axillary fold. The interscye back length was added 0.8cm by considering the body movement.

Following the result of the wearing experiment, the result was corrected and supplemented for three times to complete the final bodice block of Chinese women.

3. Wearing Experiment

1) Selection of experiment materials

The material used for the experiment of research pattern was 100% of cotton with the intermediary thickness and the properties of the experimental fabrics, which are shown on 〈Table 3〉.

〈Table 3〉 Physical Property of Materials in Experiment

Div. / Item	Organization	Weight (g/m²)	Thickness (m/m)	Density (Thread/5cm)		Extension Ratio (%)		Strength (kgf)	
				Wrap thread	Weft thread	Wrap thread	Weft thread	Wrap thread	Weft thread
Muslin 100%	Plain weave	148.9	0.39	119.6	110.4	19.4	12.0	30.2	26.8

2) Functional test

In order to obtain the objective assessment on the first and second research patterns, the functional test under the wearing condition was implemented, and it was limited for the appearance assessment only for it is the tight-fitting shape.

In order to verify the suitability of the experiment patterns of this study, the selection of the subjects was made for the major categories of earlier suggested Chinese women, including height, chest size, waist size, hip size, weight and others. By selecting 6 students of Korean college students of 19-24 years with the average sizes of body measurement figure of the correct posture and 4 Chinese students enrolled at Kyunghee University, Ewha Woman's University, Seokang University, Sookmyung Women's University and others who reside in Seoul for the first wearing experiment. As a result, 2 Korean college students who had small deviation for average sizes with outstanding fitness were selected as the subjects for the second and third wearing experiment.

The test panel for the functional test was composed of 7 persons with the graduate school students in clothing major and other specialists, and the verification of patterns developed ultimately were implemented by the pattern companies for ladies' clothing.

The test category to assess the body suitability of the bodice block was amended and supplemented by this researcher with the reference on method implemented in the previous studies with the total of 74 categories with 30 categories in the front, 19 categories in the side, 27 categories in the back and 1 category for overall, and the scoring method used the 5 point scoring system of Likert scale. And 5 points were allotted for 「Very positive」, 4 points for 「Positive」, 3 points for 「Normal」, 2 points for 「Negative」 and 1 point for 「Not at all」.

4. Data Processing and Analysis Method

After implementing the functional test, each of the average and standard deviation for each test item was formulated and obtained the overall average scores.

In order to heighten the reliability, the body measurement data of this study considered the value deviated for ±3σ(σ: standard deviation) based on the average from the measured value for each category as the extremely abnormal value to dispose as the missing value, and use the SPSSWIN 10.0 Program to process

statistically. Analysis data used a total of 58 categories including 57 categories of measured value and 1 category of calculated value (Roher's Index).

1) In order to find out the characteristics of upper body types of Chinese women, the body measurement figure and the index value were used for implementing the group analysis for the classification of the body type.

2) The average and standard deviation of each pattern of Chinese women were obtained to verify the noticeability with the F-test, and the difference for each pattern is verified with the Duncan-test afterwards.

3) In order to verify the suitability of the first and second research bodice block, the average and standard deviation for each of the 74 categories of wearing assessment category were obtained.

Ⅲ. Research Results and Consideration

1. Analysis of Upper Body Shapes of Chinese Women

1) Body classification by group analysis

In order to classify the upper body shape of Chinese women who reside in Beijing and Shanghai following the posture and shape of bending and stretching, the index category that was thought as having the closest relationship with the upper body was formulated. The index categories were consisted of 6 categories in neck point to breast point to waistline length/total length, shoulder point to back waistline length/neck point to back waistline length, neck point to back waistline length/total length, neck point to breast point to waistline length/shoulder point to back waistline length, shoulder point to breast point to anterior waist length/shoulder point to back waistline length, and interscye front length /interscye back length.

As the result of group analysis following the index category, as shown on 〈Table 4〉, the number of group is classified into 3 types shown most clearly with the distribution condition and the characteristics of the body shape, and the characteristics of each body shape on the index value for each pattern are shown as follows.

Type 1 shows the highest size at shoulder point to back waistline length/neck shoulder point to back waistline length, neck shoulder point to back waistline length/total length categories while showing the smallest size in other 5 categories, so the type 1 is the type with long back side of the upper body with bent forward shape. Type 2 is the most standard right body with the intermediary value of the 3 types in most of categories. Type 3 shows the highest size in 4 categories of neck shoulder point to breast point to waistline length/total length, neck shoulder point to breast point to waistline length/shoulder point to back waistline length, shoulder point to breast point to anterior waist length/shoulder point to back waistline length, interscye front length/interscye back length that the length of the front is long compared to the back side of the upper body that the upper body is pull-up to the back in pull-back body.

As a result of looking into the distribution condition by the body type classification, the case of right body of type 2 had the highest ratio with 149 subjects(42.8)%, followed by the bent body of type 1(34.2%) and the pull-back body of type 3 (23.0%).

<Table 4> Classification for each body type

unit: cm

	Type 1 (n=119, 34.2%)	Type 2 (n=149, 42.8%)	Type 3 (n=80, 23.0%)	F-test	Duncan test		
	M (SD)	M (SD)	M (SD)				
Neck Shoulder Point to Breast Point to Waistline Length/Total Length	0.29 (.02)	0.29 (.02)	0.30 (.01)	17.358***	b	b	a
Shoulder Point to Back Waistline Length/Neck Point to Back Waistline Length	1.02 (.04)	1.01 (.05)	0.98 (.05)	39.439***	a	b	c
Neck Shoulder Point to Back Waistline Length/Total Length	0.30 (.01)	0.30 (.02)	0.29 (.01)	8.350***	a	a	b
Neck Shoulder Point to Breast Point to Waistline Length/ Shoulder Point to Back Waistline Length	0.96 (.05)	0.98 (.06)	1.04 (.05)	133.285***	c	bc	a
Shoulder Point to Breast Point to Anterior Waist Length/Shoulder Point to Back Waistline Length	0.95 (.05)	0.97 (.06)	1.03 (.05)	151.666***	c	bc	a
Interscye Front Length/Interscye back Length	0.90 (.07)	0.92 (.08)	1.00 (.07)	137.370***	c	bc	a

As the result of the Duncan-test, the groups with noticeable differences are indicated in mutually different characters. (a<b<c).
*p<0.5 **p<0.01 ***p<0.001

2) Comparison of the measured value of upper body shape

The result of verification of noticeability for each body type of Chinese women (19~24 years of age), as shown on <Table 5>, the difference for each pattern was shown in the total of 21 categories including 1 category of width, 1 category of thickness, 7 categories of circumference, 11 categories of length and 1 category of others.

The bent body showed the highest sizes on the cervical to shoulder point length, the interscye back length, the interscye back fold length, and the shoulder point to posterior waist length, and it showed the smallest size in all other categories. The right body showed the middle sizes in all other categories except the waist to hips length and the interscye back fold length. The pull-back body showed the highest sizes in all categories excluding the waist to hips length, cervical to shoulder point length, interscye back length, interscye back fold length,

and shoulder point to posterior waist length.

Therefore, when producing the patterns, the bent body may require the enlargement of the suitability of shoulder and back parts, and the reduction of the breast part, abdomen, hip and other horizontal circumference length, and the suitability of the front part of the upper body, and when producing the patterns, the pull-back body may require the enlargement of the vertical and other horizontal circumference length, and the suitability of the front part of the upper body, and may reduce the suitability of shoulder and back parts.

2. Result of experiment of wearing for Research Bodice block

In order to verify the sizes and shape suitability of the research bodice block, a total of 3 times of wearing experiments were undertaken, and the first and second application sizes are shown on 〈Table 6〉, and the result of the wearing experiment that assess the silhouette on front, side, back and overall is shown on 〈Table 7〉.

〈Table 5〉 Comparison of measured size for each body type of Chinese women

unit: cm

Measuring Items	Statistics	19~24 years of age						F-test	Duncan-test
		Bent body		Right body		Pull-back body			
		M	SD	M	SD	M	SD		
Height	Stature	159.1	5.4	160.1	5.4	160.9	5.7	2.02	
	Menton Height	136.7	4.9	137.8	5.3	138.3	5.4	2.01	
	Anterior Neck Height	130.1	5.0	130.1	5.3	131.9	5.2	2.35	
	Chest Height	121.8	4.6	122.8	4.9	123.7	5.6	2.64	
	Bust Height	114.0	4.9	114.9	4.9	115.8	5.0	2.23	
	Underbust Height	109.0	5.0	109.4	4.9	110.3	5.7	1.16	
	Waist Height	99.4	4.2	100.1	4.3	100.5	4.7	1.09	
	Abdomen Height	89.0	4.0	90.0	4.0	90.2	4.4	1.78	
	Lateral Neck Height	134.5	4.9	135.3	5.1	135.2	6.2	0.48	
	Shoulder Height	129.3	4.8	129.9	5.1	130.9	5.3	1.69	
	Axilla Height	118.9	6.5	119.4	5.0	119.5	5.2	0.20	
	Radial Styloid Height	78.2	3.2	79.0	3.5	78.9	4.1	1.30	
	Cervical Height	135.0	4.9	136.0	4.9	136.6	5.3	1.58	
	Hip Height	78.8	3.9	78.9	4.3	79.8	4.7	1.13	

As the result of the Duncan-test, the groups with noticeable differences are indicated in mutually different characters. (a〈b〈c).
*p〈0.5 **p〈0.01 ***p〈0.001

〈Table 5〉 continued

unit: cm

Measuring Items / Statistics		19~24 years of age								
		Bent body		Right body		Pull-back body		F-test	Duncan-test	
		M	SD	M	SD	M	SD			
B r e a d t h	Shoulder Breadth	33.7	1.5	33.8	1.5	33.7	1.7	1.34		
	Bideltoid Breadth	39.7	2.3	39.9	2.9	39.8	2.9	0.08		
	Chest Breadth	27.3	1.9	27.9	2.1	28.4	2.2	4.82**	c b a	
	Bust Breadth	25.9	1.4	26.4	2.1	26.5	2.0	1.94		
	Underbust Breadth	24.7	1.4	25.0	1.9	24.9	1.8	0.85		
	Waist Breadth	22.5	1.9	23.0	2.4	22.8	2.2	0.78		
	Abdomen Breadth	29.3	2.1	29.9	2.4	30.2	2.3	2.55		
	Hip Breadth	31.7	1.9	32.4	2.0	32.4	1.9	3.25		
D e p t h	Chest Depth	17.8	1.5	18.1	1.6	18.4	1.8	2.35		
	Bust Depth	21.0	2.0	21.7	2.3	22.0	2.4	3.25*	b a a	
	Underbust Depth	18.5	1.7	18.5	2.3	19.3	2.2	3.35		
	Waist Depth	17.3	1.9	17.7	2.4	17.7	2.0	0.75		
	Abdomen Depth	19.5	2.0	20.1	2.8	20.1	2.5	1.47		
	Armscye Depth	9.8	1.0	9.9	1.3	10.0	1.2	1.06		
	Hip Depth	20.2	1.9	10.4	2.2	20.4	2.0	1.04		
C i r c u m f e r e n c e	Neck Base Circumference	36.9	1.6	36.9	2.0	37.0	1.7	7.41		
	Chest Circumference	81.3	4.4	82.5	6.0	83.2	5.6	2.14*	b a a	
	Bust Circumference	82.3	4.7	84.0	7.0	85.0	6.7	3.39*	b b a	
	Underbust Circumference	72.2	4.5	73.2	5.5	74.5	5.6	3.06*	b a a	
	Waist Circumference	65.5	6.2	66.7	6.9	67.4	6.7	1.69		
	Abdomen Circumference	80.4	5.4	81.9	7.4	83.0	7.0	2.81*	c b a	
	Hip Circumference	88.8	4.4	90.1	5.6	90.7	5.3	2.69*	b b a	
	Armscye Circumference	36.4	2.5	36.7	2.8	37.3	2.9	3.14*	b b a	
	Upperarm Circumference	26.1	2.4	26.4	2.7	26.7	2.6	0.69		
	Elbow Circumference	21.8	1.4	22.1	1.9	22.1	1.5	1.48		
	Wrist Circumference	14.9	0.8	14.9	0.9	14.8	0.8	0.55		
	Hand Circumference	21.1	1.0	20.8	1.2	20.8	0.9	1.45		
	Neck Back Circumference	15.6	0.8	15.8	1.0	16.1	0.9	89.08***	c b a	

As the result of the Duncan-test, the groups with noticeable differences are indicated in mutually different characters. (a<b<c).

*p<0.5 **p<0.01 ***p<0.001

〈Table 5〉 continued

unit: cm

Measuring Items / Statistics		19~24 years of age							F-test	Duncan-test		
		Bent body		Right body		Pull-back body						
		M	SD	M	SD	M	SD					
Length	Front Waist Length	32.1	1.7	32.6	1.8	33.5	1.8	11.84***	c	b	a
	Neck Shoulder Point to Breast Point Length	24.7	1.5	25.2	2.0	25.2	1.5	2.56			
	Neck Point to Breast Point to Waistline Length	39.2	1.9	39.9	2.1	40.7	1.8	9.63***	c	b	a
	Shoulder Point to Breast Point Length	21.6	1.7	22.4	2.0	22.8	1.6	7.85***	c	b	a
	Shoulder Point to Breast Point to Anterior Waist Length	38.3	1.7	39.0	2.0	40.3	1.8	20.81***	c	b	a
	Interscye Front Length	31.3	1.7	31.9	1.9	32.4	2.0	6.23***	c	b	a
	Interscye Front Fold Length	31.8	1.9	32.6	2.0	34.3	2.0	29.38***	c	b	a
	Bust Point-Bust Point Length	17.0	1.4	17.3	1.7	17.2	1.7	1.33			
	Shoulder Point Axillary Level at Upper Arm Length	11.6	1.2	11.7	1.1	12.0	1.0	1.97			
	Upperarm Length	29.6	1.6	29.8	1.8	30.2	1.7	2.52			
	Arm Length	52.4	2.3	52.6	2.6	53.4	2.4	3.15*	b	b	a
	Waist to Hips Length	21.5	2.0	22.4	2.8	22.0	1.9	3.45*	b	a	b
	Cervical to Shoulder Point Length	19.1	1.1	19.0	1.2	18.9	1.0	6.02			
	Shoulder Length	12.5	1.0	13.0	1.0	12.4	0.9	0.54			
	Bishoulder Length	38.9	2.1	38.9	2.3	38.7	2.3	7.15			
	Interscye Back Length	35.6	2.0	34.7	2.6	34.2	2.2	6.42***	a	b	c
	Interscye Back Fold Length	33.7	2.4	33.5	3.0	32.7	2.8	4.19**	a	a	c
	Scye Length	17.4	1.3	17.5	1.4	17.7	1.4	0.90			
	Waist Back Length	37.3	1.6	37.4	1.6	37.0	2.0	0.96			
	Shoulder Point to Axillary Level at Midspine Length	24.9	1.4	24.8	1.5	24.7	1.8	2.07			
	Neck Point to Posterior Waist Length	39.6	1.7	39.8	2.1	40.0	2.1	2.41			
	Shoulder Point to Back Waistline Length	40.7	1.8	40.3	2.0	39.4	2.0	8.25***	a	b	c
Angle	Right Shoulder Slope(°)	22.6	3.9	22.0	3.9	22.1	4.4	1.51			
	Left Shoulder Slope (°)	22.3	4.0	22.1	3.8	21.7	3.9	1.28			
Other	Weight(kg)	50.5	5.7	52.8	8.7	53.4	7.5	3.09*	c	a	a
	Rohrer	1.3	0.1	1.3	0.2	1.3	0.2	0.84			

As the result of the Duncan-test, the groups with noticeable differences are indicated in mutually different characters. (a〈b〈c).
*p〈0.5 **p〈0.01 ***p〈0.001

〈Table 6〉 Size applied the first and the second bodice block for Chinese women

unit: cm

	Required category	Average size of body	1st application size(◎)	2nd application size	Corrected measurement
Circum-ference	Neck Base Circumference	36.9	37.2	37.8	◎+0.6
	Bust Circumference	84.0	84.0	84.0	−
	Waist Circumference	66.7	67.6	67.0	◎−0.4
	Hip Circumference	90.1	92.0	92.0	−
Length	Shoulder Length	13.0	12.5	12.5	−
	Front Waist Length	32.6	34.0	33.7	◎−0.3
	Waist Back Length	37.4	36.5	37.8	◎+1.3
	Interscye Front Fold Length	31.9	33.5	33.0	◎−0.5
	Interscye Back Length	34.7	35.5	35.0	◎−0.5
	Neck Shoulder Point to Breast Point Length	25.2	25.5	24.7	◎−0.8
	Bust Point−Bust Point Length	17.3	18.0	18.0	−
	Waist to Hips Length	22.4	22.0	22.0	−

〈Table 7〉 Results of the 2nd bodice block wearing test

Classification		Questionnaire of Assessment for Functional test	Average	Standard deviation
Front Part	Spare part	1. Is the neck front circumference line sufficient with sufficient room?	4.60	0.55
		2. Is the bust front part appropriate with sufficient room?	4.80	0.45
		3. Is the interscye front line part appropriate with sufficient room?	4.40	05.5
		4. Is the bust front part appropriate with sufficient room?	4.80	0.65
		5. Is the waist front part appropriate with sufficient room?	4.60	0.45
		6. Is the hip front circumference part appropriate with sufficient room?	4.20	0.35
		7. Is the armscye front circumference part appropriate with sufficient room?	4.80	0.55
		8. Is the entire front appropriate with sufficient room?	4.20	0.45

〈Table 7〉 continued

Classification		Questionnaire of assessment for Functional test	Average	Standard deviation
F r o n t P a r t	Standard line	1. Is the center front line vertically placed?	5.00	0.00
		2. Is the width of the neck front circumference line appropriate?	4.00	0.45
		3. Is the depth of the neck front circumference line appropriate?	4.00	0.45
		4. Is the size and shape of the neck base front circumference line appropriate?	3.80	0.65
		5. Is the length of the shoulder appropriate?	4.60	0.75
		6. Is the location of the interscye front line appropriate?	4.40	0.55
		7. Is the chest circumference placed horizontally on its position?	4.60	0.55
		8. Is are the location (height) and distance of nipple point appropriate?	4.80	0.45
		9. Is the waist circumference placed horizontally on the right place?	4.00	0.75
		10. Is the middle hip front line placed horizontally on the right place?	4.40	0.45
		11. Is the hip circumference located horizontally on the right place?	4.60	0.55
	Dart	1. Is the location of the bust front dart appropriate?	3.80	0.65
		2. Is the bust front dart volume appropriate?	4.60	0.75
		3. Is the bust front dart length appropriate?	4.40	0.55
		4. Is the waist front dart location appropriate?	4.60	0.55
		5. Is the waist front dart volume appropriate?	4.80	0.45
		6. Is the waist front dart length appropriate?	4.00	0.75
	Wrinkle	1. Are there any wrinkles around the neck front circumference part?	4.60	0.45
		2. Are there any wrinkles around the bust front part?	4.20	0.35
		3. Are there any wrinkles around the armscye front part?	4.80	0.55
		4. Are there any wrinkles around the front–side seam line part?	4.20	0.45
	Overall	1. Is the entire appearance on the front good?	4.60	0.55

〈Table 7〉 continued

Classification		Questionnaire of assessment for Functional test	Average	Standard deviation
S i d e s P a r t	Spare part	1. Is the shoulder part appropriate with sufficient room?	4.60	0.45
		2. Is the side-bust part appropriate with sufficient room?	4.80	0.55
		3. Is the waist and back part appropriate with sufficient room?	4.40	0.65
		4. Is the waist-front waist part appropriate with sufficient room?	4.20	0.45
		5. Is the waist-back part appropriate with sufficient room?	4.80	0.65
		6. Is the armhole width appropriate with sufficient room?	4.00	0.55
		7. Is the entire side appropriate with sufficient room?	4.80	0.55
	Standard line	1. Is the location of the shoulder line appropriate?	4.00	0.45
		2. Is the curve of the scye depth appropriate?	4.80	0.55
		3. Is the line around the scye natural?	4.60	0.65
		4. Is the side seam line correctly placed?	4.00	0.00
		5. Is the interscye line placed horizontally on the right place?	4.00	0.55
		6. Is the chest circumference line placed horizontally on the right place?	4.80	0.55
		7. Is the waist circumference line placed horizontally on the right place?	4.40	0.65
		8. Is the hip circumference line placed horizontally on the right place?	4.20	0.45
	Wrinkles	1. Are there any wrinkles on the scye front part?	4.80	0.55
		2. Are there any wrinkles on the scye back part?	4.60	0.45
		3. Are there any wrinkles on the Armscye part?	4.60	0.45
	Overall	1. Is the entire appearance on the side good?	4.80	0.45
B a c k P a r t	Spare part	1. Is the neck back circumference part appropriate with sufficient room?	4.20	0.45
		2. Is the shoulder back part appropriate with sufficient room?	4.40	0.55
		3. Is the interscye back line part appropriate with sufficient room?	4.00	0.65
		4. Is the back part appropriate with sufficient room?	4.60	0.55
		5. Is the waist back part appropriate with sufficient room?	4.60	0.45

〈Table 7〉 continued

Classification		Questionnaire of assessment for Functional test	Average	Standard deviation
B a c k P a r t	Spare part	6. Is the hip back circumference part appropriate with sufficient room?	4.20	0.45
		7. Is the armscye back circumference part appropriate with sufficient room?	4.60	0.00
		8. Is the entire backside appropriate with sufficient room?	5.00	0.00
	Standard line	1. Is the center back line vertically placed?	4.60	0.45
		2. Is the depth of the neck back circumference line appropriate?	4.40	0.55
		3. Is the depth of the neck back circumference line appropriate?	4.00	0.55
		4. Is the neck base front circumference line naturally fit?	4.20	0.45
		5. Is the bust back circumference line placed horizontally on the right place?	4.80	0.45
		6. Is the waist back circumference line placed horizontally on the right place?	4.80	0.55
		7. Is the middle hip back circumference line placed horizontally on the right place?	4.60	0.45
		8. Is the hip back circumference line placed horizontally on the right place?	4.40	0.55
	Dart	1. Is the location of the shoulder blade dart appropriate?	4.00	0.55
		2. Is the volume of the shoulder blade dart appropriate?	4.20	0.45
		3. Is the length of the shoulder blade dart appropriate?	4.80	0.45
		4. Is the location of the waist back dart appropriate?	4.80	0.55
		5. Is the volume of the waist back dart appropriate?	4.40	0.55
		6. Is the length of the waist back dart appropriate?	4.60	0.65
	Wrinkles	1. Are there any wrinkles on the neck back circumference part?	4.80	0.45
		2. Are there any wrinkles on the back part?	4.80	0.55
		3. Are there any wrinkles on the armscye back part?	4.40	0.45
		4. Are there any wrinkles on the back−side seam parts?	4.60	0.45
	Overall	1. Is the entire appearance on the back good?	4.60	0.55
Entire		Is fitness outstanding overall?	4.80	0.45

1) Outcome of front wearing experiment

For the front, it displayed much higher suitability in general than the research bodice first wearing experiment. The depth of neck front depth on the neck back circumference was greatly improved for the fitness than the first wearing experiment, but if the depth was adjusted in larger scale, the fitness would be likely to make improvement even more. The front waist length was set for 1.4 cm longer than the first wearing experiment to have the pulling phenomenon of the front part along with the breast area that the clothes fit into the body naturally for a high suitability. With the sufficient available volume around the armscye front circumference to move into the bust front dart that resulted in 0.5cm larger bust front dart dart than the first wearing experiment to remove the wrinkles on the armscye front circumference to show high suitability of size and shape around the shoulder and armscye circumference.

2) Outcome of side wearing experiment

For the sides, it displayed much higher suitability in general than the research bodice block first wearing experiment. The axilla was set for 1.2cm lower in order to improve the

fitness by disappearing the pulling phenomenon by tightening of the armscye part for the interscye front line and interscye back line and armscye front circumference and armscye back circumference. The length of front center is lengthened than the first wearing experiment that it added for 1.4cm of spare length to even the waist front line with the horizontal line.

3) Outcome of rear wearing experiment

In the case of rear side, it displaced very high suitability in general that was displayed research bodice block first wearing experiment. It was set for 1.2cm longer in order to remove the wrinkles and maintain the horizontal bust line, and the interscye back line was reduced for 0.5cm to improve the fitness

3. Design of bodice block for Chinese Women

The problems appeared on this study with the outcome of the first and second wearing experiment were corrected and supplemented to heighten the body suitability and applied the final size, as shown on ⟨Table 8⟩, and the final bodice block drafting method was presented on ⟨Fig. 1⟩.

⟨Table 8⟩ Setting up of standard size for developing the bodice block for Chinese women

unit: cm

	Required category	Average body size	Applied size	Pattern size
Length	Shoulder Length	13.0	12.5	12.5
	Front Waist Length	32.6	34.0	33.5
	Waist Back Length	37.4	37.5	38.2

〈Table 8〉 continued

unit: cm

	Required category	Average body size	Applied size	Pattern size
Length	Interscye Front Fold Length	32.6	33.0	33.0
	Interscye Back Length	34.7	35.0	35.0
	Neck Shoulder Point to Breast Point Length	25.2	25.5	24.5
	Bust Point-Bust Point Length	17.3	18.0	18.0
	Waist to Hips Length	22.4	22.0	22.0
Circumference	Neck Back Circumference	36.9	37.0	38.6
	Bust Circumference(Front/Back)	84.0	84.0	86.0
	Waist Circumference(Front/Back)	66.7	67.0	18.0 / 16.0
	Hip Circumference(Front/Back)	90.1	90.0	48.0 / 44.0
	Armscye Circumference(Front/Back)	36.7	37.5	18.9 / 18.6
Others	Neck Front Depth	−	−	7.1
	Neck Back Depth	−	−	2.4
	Neck Front Breadth	−	−	6.8
	Neck Back Breadth	−	−	7.0
	Scye Depth	−	−	15.6
	Underarm to Side Seam Length	−	−	19.0
	Bust Front Dart Value, Front	−	−	6.0
	Shoulder Blade Back Dart Value	−	−	1.3
	Shoulder Blade Back Dart Length	−	−	7.2
	Front Waist Dart Value(1st dart value)	−	−	3.0
	Small Side Front Dart Value (2st dart value)	−	−	1.0
	Center Back Dart Value	−	−	1.0
	Back Dart Value	−	−	3.0

(1) The basic line

① XY : Hip axis

② AB : 1/2Hip Measurement+3cm(ease for construction)

From A and B, draw two perpendicular lines upward hip axis(XY).

These are the center back and front lines.

③ BE : Length between waist and hips=22cm

Draw FE parallel to AB.

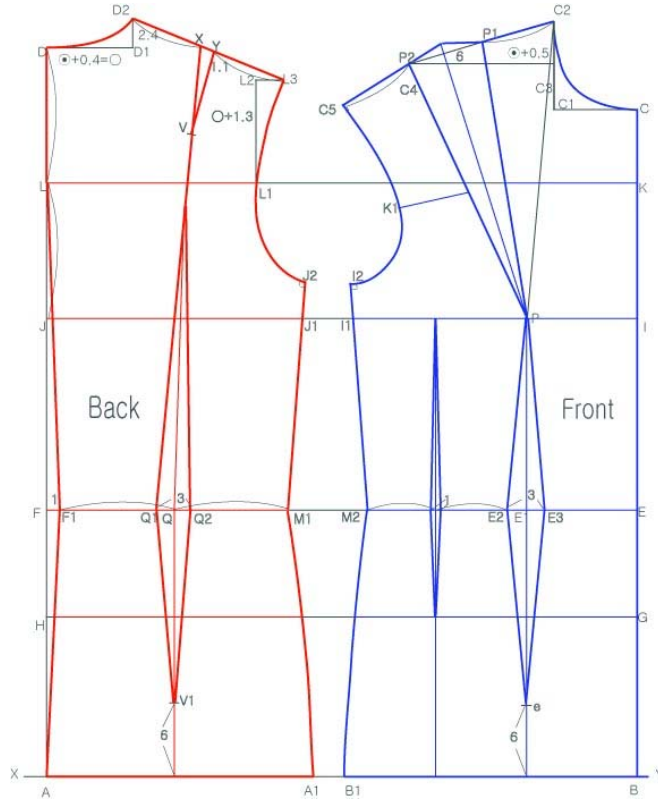④ GH : Along the center front line, place G 9cm below E.

Draw GH parellel to EF.

⑤ BC : Center front line

Along the center front line from point E, place the front waist-length measurement.

⑥ AD : Center back line

Along the center back line from point F, place the back waist-length measurement.

〈Fig. 1〉 Production drafting method of
bodice block of Chinese women

(2) The neck base line

The front neck line

① CC1=1/2neck front breadth=(1/2neck base line÷3)+0.6cm

② C1C2=(1/2neck base line÷3)+0.5cm
   C1C2 is perpendicular to CC1.

③ Draw a curve between C2 and C : front neck line
   (from C, a straight line is maintained, 1.5cm long, from where curve follows.)

The back neck line

① DD1=1/2neck back breadth=(1/2neck base line÷3+0.6cm)+0.4cm
   At center from D draw a perpendicular line approximately 10cm long.

② D1D2=2.4cm
   From D1, draw a line parallel to center back line and place D2.

③ Draw a curve between D and D2 : back neckline.
   From D, a straight line is maintained 3cm long, from where curve follows.

(3) The bust line

① EE1=1/2bust value.
   Along waistline, place E.
② From E1, draw a parallel line to the center front line.
③ C2P=the neck shoulder point to breast point length
   From this parallel line, draw a straight line to C2, forming the neck shoulder point to breast point length.
④ JI : the bust line
   P represents the level of the bust line and draw the bust line to center back line.

(4) The interscye line

① At center back : point L=1/2DJ
② LK: From L, draw a perpendicular line to center back and center front lines.

(5) The shoulder line

The front shoulder line
① C1C3=1/3C1C2
② From C3 draw a line perpendicular to C2C1 approximately 20cm long.
③ C2C4=The shoulder length
   From C2, and this perpendicular, draw the shoulder line length.

The back shoulder line
① LL1=1/2Interscye back length
② L1L2=DD1+0.4cm
   From L1, draw a perpendicular line upward.
③ From L2, draw a line outwards, perpendicular to L1L2.
④ D2L3=shoulder length+shoulder blade dart

value(1.3cm)
Draw shoulder line D2L3.

(6) The side seam axis

The side seam line will not be place at the exact half distance between center front and center back. They are shifted 1cm towards center back.
① On hip line,
   AA1=1/4hip measurement−1cm
   BB1=1/4hip measurement+1cm
② On bust line,
   JJ1=1/4bust measurement+1.25cm(ease)−1cm
   II1=1/4bust measurement+1.25cm(ease)+1cm
   This added value of 205cm permits the bust measurement to remain intact when the darts are traced
③ Join A1J1 and B1I1 with straight lines.

(7) The curved side seams and the dart

The waist darts value
① (FN1+N2E)−1/2waist measurement=excess
   This excess shall be divided equally between the front and the back.
② Back darts value : center back dart=1cm
   back dart value=3cm
③ Front darts value : 1st dart value=3cm
                        2nd dart value=1cm
④ Excess−total dart value=the remaining value for side curve
   Distribute this value on front and back so that : M1N1=N2M2=the remaining value for side curve/2
⑤ Draw identical curves : A1M1, B1M2

The back darts

① Center back dart : Value along waist line is 1cm from F=FF1

From F1 draw a straight line to hipline at A and a straight line to Interscye Back line at L.

② Shoulder blade dart is located at the middle of the shoulder line. From D2 using 1/2 the shoulder length measurement, place point X

D2X=YL3=1/2shoulder length measurement

XY(shoulder blade dart)=1.3cm

③ Back waist dart value=3cm at waist line

   i. The center of the dart Q is placed 1/2 way between M1 and F1.

    Place 1/2dart value(1.5cm) on either side of the center of the dart, forming Q1 and Q2.

   ii. Join X and Q1 by a straight line.

    Along line XQ1 place the shoulder blade dart length 6cm below the shoulder seam. Trace shoulder blade dart.

   iii. Along line XQ1, place 1/4V of the way between the interscye front line and the bust line. Join QV and Q2V by a straight line.

    Back waist dart located below waistline : QVl is parallel to center back.

   iv. QV1=hip length−6cm

   v. Join Q1V1 and Q2V1 by a straight line.

The front darts

① The bust dart

   i. Along front shoulder line, place P1 half-way between C2 and C4(1/2C2C4=P1)

   ii. P1P2=(bust measurement/2)÷7

    P1P2 is placed along shoulder line : Join P1P and P2P by a straight line.

   iii. Close bust dart and retrace :

    The shoulder line, so that C2C5=shoulder length

   iv. The interscye front line, so that KK1=the interscye front fold measurement

    Retrace dart top using a tracing wheel.

② The front waist dart(dart value at waistline=3cm)

   i. Place 1/2 of dart value(1.5cm) on either side of E1, forming E2 and E3.

   ii. Extend line PE1 to point P3.(P3=hip length−6cm)

    Join E3P, E2P, E2P3 and E3P3 by a straight line.

③ The small side front dart(dart value at waistline=1cm)

   i. t=1/2M2E2

    The center of the dart, t, is placed along waistline way between M2 and E2. From t, draw a line parallel to center front line.

   ii. Place 1/2 of dart value(0.5cm) on either side of t.

    Draw the dart, from waistline to bustline, and from waistline to small hipline.

Side seam lines and the armholes

1) Join M1J1 and M2l1 by a straight lines.

2) Underarm side seam length : M1J2=M2l2 =(back waist length+front waist length) /4+1.3cm

3) Using a curve draw the following : Back armhole J2L1L3.

From J2 a straight line is maintained 1cm long, from where curve follows.

4) Using a curve draw the following : Front armhole l2K1C5.

From l2 a straight line is maintained 1.5cm long, from where curve follows.

4. Comparison of Bodice Block of Chinese Women

The result of comparison based on the chest size of the bodice block for Chinese women and the research of bodice block from the existing study is shown on ⟨Fig. 2⟩.
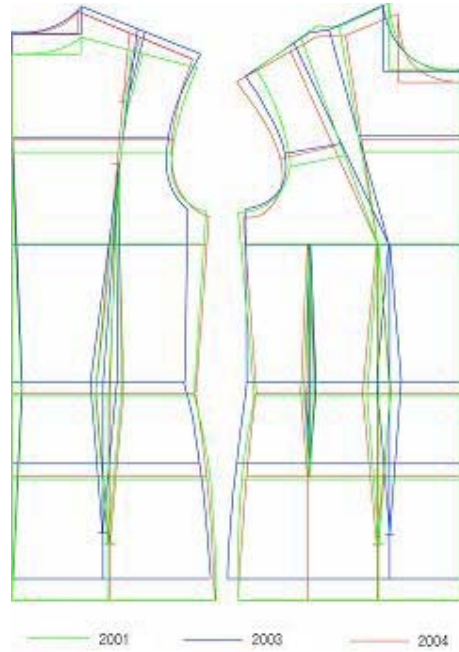
In 2001, the development pattern (Jang, Hee-kyung; 2001) classified the body pattern into 4 types and the development was made based on the most frequency in pull-back body. Comparing to the research pattern, the locations of the chest circumference, waist circumference, abdomen circumference, and hip circumference were closely consistency, but the center front waist length is longer, the location of shoulder line moved back for shallow neck front breadth, and the waist back length was short to have the location of interscye line lowered.[8]

In 2003, the development pattern (Wee, Hye-Jung; 2003) was developed based on the average body size for the standard body type of Chinese women. Comparing to the research pattern, the difference on the location of interscye line, neck front breadth and neck front depth based on the chest circumference was not much, but the horizontal length between the nipples that determined the waist dart and the bust front dart was short that the dart moved to the front center and the side seam line was moved to the back to have the long waist front circumference and short waist back circumference.
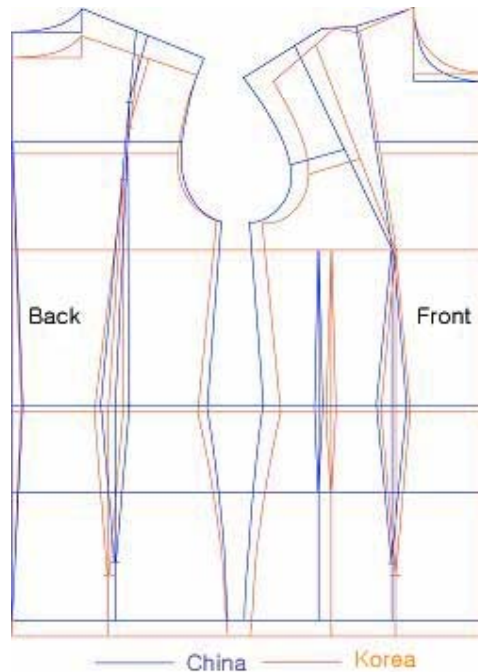
5. Comparison with Bodice Block of Korean Women

The result of comparison based on the chest circumference of the women's clothes for Chinese and Korean adults is shown on ⟨Fig. 3⟩.

In 2003, the development pattern (Kim, Ji-Min; 2003)[9] set the standard size of Korean women around early 20s and presented the tight-fitting shape of torso pattern drawing method. Comparing to the research pattern, the bodice block of Chinese has shorter front waist length and longer back length, and the front shoulder with warp thread angle was lower and the neck depth was deeper than the bodice block of Korean based on the lateral neck. Chinese women have the breasts protruded more than those of Korean women that the bust front dart length is longer with more volume of dart. The horizontal distance between the nipples was longer for Chinese than Korean, and the location of the waist front dart is moved to the side seam line.

〈Fig. 2〉 Comparison of existing bodice block of Chinese women

〈Fig. 3〉 Comparison of bodice block of Korean and Chinese women

Ⅳ. Conclusion and Proposition

The purpose of this study was to provide fundamental data for improving the fitness of clothing products that are exported to China for the Chinese women. For this purpose, the upper body shape of the Chinese women was classified and the bodice block is designed. Through the wearing experiment, the bodice block for Chinese women that is corrected and supplemented was developed.

The conclusion of this study is as follows.

1. As the basic stage of developing the tight—fitting shape bodice block, the body classification approaches under the posture and shape of bending and stretching was selected, and for the criteria of the body discretion, it uses 6 index categories of the neck point to breast point to waistline length/total length, shoulder point to back waistline length/neck point to back waistline length, neck point to back waistline length/total length, neck point to breast point to waistline length/shoulder point to back waistline length, shoulder point to breast point to anterior waist length/shoulder point to back waistline length, and interscye front length /interscye back length. As the result, the body pattern is classified into 3 body types of bent body, right body, and pull—back body.

2. For the development of bodice block, the tight—fitting shape ESMOD bodice block drawing method was selected, and the dimension was applied with the right body of average body size. The developed bodice research pattern corrects and supplements the parts that displays the generally low suitability by verifying the feasibility based on the wearing experiment. For the case of front, it is the bust circumference line, waist circumference line, neck front depth, bust front dart volume, and armscye front part, and for the case of the back, it is the waist back circumference line, back, and armscye back part, and in the case of the sides, it is the location of shoulder line and armscye depth.

3. The final bodice block drawing method that has been amended and supplemented for 3 times is presented under 〈Fig. 1〉.

4. Through the combination of the bodice block of the Chinese women and the bodice block under this study, and research bodice block, the difference in pattern is compared based on the center front line, center back line and bust circumference line. The difference is shown on the neck front depth, neck front breadth neck back depth, bust front dart volume, shoulder warp thread angle, bust circumference line, and hip circumference line.

5. Through the combination of the bodice block of the Korean women and the bodice block under this study, and the research bodice block, the difference in pattern is compared based on the center front line, center back line and bust circumference line. The difference is shown on the neck front depth, neck front breadth, neck back depth, bust front dart volume, shoulder warp thread angle, waist circumference line, and hip circumference line.

The proposition of the limitation of this research and the ensuring studies shall be as follows.

1. The sample was targeted for 19—24 years of age and the areas of Beijing and Shanghai that it may not be appropriate for external feasibility for interpreting in entire China that a care shall be taken for generalization.

2. The subjects for this study were for college students in Korea with the age generally in 20s, however, the ensuring studies have to take 19-24 years of Chinese women for experiment.

3. The subject for experiment in this study was limited to women of 20s in general who have not much of variation in physical shape, but in the ensuing studies, there has to be study on ages for those who are not to reach to years of age as well.

4. In addition, the study not only contains the right body that reflects the classified body pattern under this study, but also the studies on the right body and other bent body and the pull-back body.

5. While looking into the outcome of the wearing experiment, the size required for the bodice block drafting method was used by calculating the average size that the most average body type has high suitability, but the body type that was deviated from average may have some problems in suitability of the pattern that there is a need for sufficient and accurate body measurement and close observation while utilizing the pattern.

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