〔보 문〕

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A Study on the Development of Men's Basic Bodice Patterns According to Somatotypes

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Abstract

본 연구의 목적은 적합성과 기능성이 고려된 체형별 남성 상의원형 패턴을 개발하는데 있다. 피험자는 인체계측자료와 측면체형 사진에 의해 선정하고, 체형은 굴신체형, 표준체형, 반신체형으로 분류하였다. 체형별 실험원형 패턴의 평가를 위하여 기존원형을 선정하였으며, 연구 결과는 다음과 같다;

1. 착의평가 결과 표준체형은 대부분의 항목에서 적합하였으나, 굴신체형과 반신체형에서는 많은 차이가 있었다. 이러한 차이는 앞길이와 등길이 뿐만 아니라 여유량과 윗가슴둘레에서 나타난다. 앞품과 뒤품은 외관에 의해 많은 영향을 받으며, 증가된 옆품은 앞품과 뒤품의 부족분을 보충하는 역할을 하였다. 따라서 실험패턴은 기존패턴보다 각 체형에 더욱 적합하며, 체형적합성과 동작기능성이 고려된 의복 제작을 위한 패턴설계는 인체의 구조와 동작연구에 의해 가능하였다.

2. 기본원형 패턴 설계를 위한 필요치수는 목뒤높이, 등길이, 앞길이, 윗가슴둘레, 앞품과 뒤품이며, 체형분류의 기준은 윗가슴둘레, 앞품, 뒤품, 앞길이, 등길이이다.

이와 같은 결과를 근거로 가슴둘레선은 [(B/2+B/10)], 뒤진동깊이는 [(B/10+목뒤높이/10)]로 설정하고, 앞내림은 1.5cm로 하였다.

Key words: basic bodice pattern, bending somatotype, standard somatotype, turning over somatotype, ease-amount, wearing evaluation;
상의원형 패턴, 굴신체형, 표준체형, 반신체형, 여유량, 착의평가.

I. Introduction

Despite the short history of ready-to-wear, economic growth, a shift in consumer awareness of and interest in fashion, and the effort and investment made by the industry, have all played an important role in the expansion of the fashion industry in Korea. Since the production of ready-to-wear is targeted at many unspecified customers, it requires measurement data and basic bodice patterns suitable for somatotypes.

However, with the increase in the demand for custom-made or easy-order (Choi and Shon, Heesoon, 2000), it has become apparent that the fit for somatotypes and the size-system of ready-to-

wear do not meet consumers' needs. There is a lack of adaptability to various and complicated somatotypes beginning with men in their late 20's, and few studies have been made on men's wear since most Korean males belong to a balanced somatotype.

Therefore, the purpose of this study is to develop basic bodice patterns for men according to somatotype and taking into account both fit and comfort.

Ⅱ. Method and Procedure

1. Subjects and Anthropometry

Six male Seoul residents in their 30's with prominent somatic characteristics were recruited to be photographed. The anthropometric measurements were taken using the method employed by R. Martin's and KS A 7004 (AT & S, 1999) and the antropometry terms of KS A 7003 (AT & S, 1999). The subjects were measured in wearing trunks, standing upright with toes spread 45° apart. The anthropometric measurement was conducted on 21 items (Table 1) including directly measured and computed items.

Suh's (1988) classification of somatotype served as the framework for this research: (a) the bending somatotype featuring a longer back length than front, wider back interscye breadth than front, tall and thin people, (b) the standard somatotype

Table 1. Measurement data of subjects (unit: cm)

No.	Measurement items	Bending Somatotype		Standard Somatotype		Turning over Somatotype	
		A	B	C	D	E	F
1	Age (year)	36.00	36.00	33.00	37.00	39.00	30.00
2	Weight (kg)	64.00	63.00	65.65	68.45	78.50	84.00
3	Stature	175.00	174.50	173.80	169.00	172.70	177.00
4	Rohrer's Index (c)	1.19	1.19	1.25	1.42	1.52	1.51
5	Full length posterior	150.50	151.50	152.80	143.00	148.00	148.50
6	Back length	47.50	48.00	45.50	44.00	47.40	44.00
7	Front length	49.30	49.00	49.30	45.20	51.00	50.00
8	Shoulder length posterior	41.50	40.00	42.50	44.00	47.50	47.00
9	Back interscye breadth	38.50	37.50	39.00	40.00	43.00	43.50
10	Front interscye breadth	32.70	33.50	34.20	36.50	39.00	41.00
11	Chest breadth at scye	30.90	31.40	30.60	33.20	33.20	35.70
12	Waist breadth	27.90	28.60	27.70	27.30	31.10	33.00
13	Neck base circumference	38.20	39.00	38.60	39.70	43.10	42.80
14	Chest circumference at scye	92.00	93.50	95.00	95.00	104.00	105.40
15	Chest circumference	90.50	92.20	89.20	90.50	99.50	100.50
16	Waist circumference	80.00	78.80	79.80	79.50	88.00	91.50
17	Armhole circumference	41.80	41.00	41.90	41.10	43.00	45.20
18	Chest depth at scye	22.20	28.20	21.30	20.30	26.60	26.70
19	Waist depth	21.10	20.80	21.10	20.30	23.80	24.30
20	Left shoulder slope (°)	20.00	20.00	22.00	21.00	22.00	23.50
21	Right shoulder slope (°)	21.50	19.50	20.00	22.50	23.00	23.50

(c) : computed item.

balanced overall in standing upright and (c) the turning over somatotype with a wider front interscye breadth than back and a longer front than back consisting of obesity.

Accordingly, based on the subjects' photographs and measurements, A and B were classified into the bending somatotype, C and D into the standard somatotype, and E and F into the turning over somatotype respectively.

2. Construction of Experimental Basic Bodice according to Somatotypes

To evaluate the experimental basic pattern based upon somatotypes, the first experimental basic bodices were made with measurement data of each subject by selecting the conventional basic bodice pattern and sleeve pattern (Kim, 1992). Kim's basic pattern model, developed for the standard balanced somatotype, was employed because of the fit for front and back interscye breadth and shoulder area with some ease at chest circumference at scye. The experimental basic bodices made from muslin and using the measurements of the subjects were designed and constructed according to somatotypes after being worn three times.

3. Wearing Evaluation

(1) In the sensory evaluation, two out of six subjects were each investigated according to somatotypes by a panel composed of ten professionals from the ready-to-wear industry. Twenty items(Table 2), as mentioned in the preceding study(Kim, 1992), were selected for evaluation items to be scored on a five-point rating scale from five points for "excellent" to one point for "very poor".

(2) Since the functional test should evaluate the fit of the clothing, counterparts were assorted to give priority to primary subject as a criterion of the secondary one, followed by a one-to-one comparison for the test. The test was conducted on four motions repeated three times and evaluated according to a five-point rating scale: (a) 0 points for a similarity of comfort level, (b) one point for more comfort, (c) two points for the most comfort, (d) minus one point for lesser comfort, and (e) minus two points for the least comfort. The stages for the test of each motion and pose were as follows: the posture of working at the office (motion 1), the posture of holding knob (motion 2), the posture lifting your arms up at 90° in front (motion 3) and

Table 2. Items of sensory evaluation

Regions	Evaluation Items
Neck	1. Is the neckline well placed?
	2. Are the neck width & depth suitable?
Shoulder	3. Is the shoulder line well placed?
	4. Any projection in scapula region?
Front & Back interscye breadth	5. Does the front interscye breadth have some ease?
	6. Does the back interscye breadth have some ease?
Chest line	7. Is the chest circumference at scye consistent with the chest circumference line?
	8. Does the chest circumference have some ease?
Armhole	9. Is the armhole line well placed?
	10. Any wrinkles at front armhole?
	11. Any wrinkles at back armhole?
Waist line	12. Is the waist line well placed?
	13. Does the waist line have some ease?
	14. Is the side seam line well placed?
	15. Any projection at the upper part of back waist line?
Center line	16. Is the center front line well placed?
	17. Is the center back line well placed?
Appearance	18. Is the front neat in appearance?
	19. Is the back neat in appearance?
	20. Is the side neat in appearance?

the posture of lifting your arms at a 45° sideways angle (motion 4).

(3) The measurement of the pressure of the clothing was conducted to observe the fit of pattern, employing the same motion and pose the functional test. Each motion was measured at an interval of 0.5 seconds for five seconds, obtaining a mean of the respective motions after three-times repetitive measurement. In addition, sensors measuring the pressure of the clothing were also attached (Fig. 1) at ① front-mid spot of upper arm, ② shoulder point, ③ back from right shoulder-mid spot, ④ scapular spot and ⑤ under scapular spot of back side.

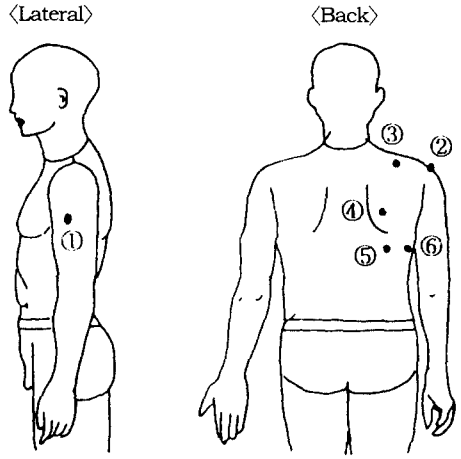

Fig. 1. Adhesive region of sensor

4. Data Analysis

The results of the wearing experiment on each experimental basic bodice were on the basis of the calculation for items mean and standard deviation, the difference between the respective experimental basic bodices, and an investigation of one-way ANOVA for the examination of significance. The SPSS Package was used in all statistical analysis.

Ⅲ. Results and Discussion

1. Results of Wearing Evaluation

1) Results of Sensory Evaluation (Table 3)

To design a men's basic bodice pattern for somatotypes, a conventional basic bodice pattern was selected. The first experimental basic bodices were made based on the measurements of the respective subjects. A sensory evaluation was taken three times during the wearing test. Men's basic bodices based on somatotypes were designed and manufactured by means of first and second modification. In addition, the results of the sensory tests on the experimental basic bodices were assessed from the means, standard deviation, and overall means. An analysis of variance was conducted to assess the level of the significance of the results correlated to the first, second, and third test.

The results are as follows:

The first experimental basic bodices using equal ease-amounts were affected by the dimension of the chest circumference at scye. The breadth and length of shoulder sites were different in length in accordance with front and back interscye breadth. The experimental basic bodice for the bending somatotype, which required an area adjustment resulting from the prominence of the scapula, was softened by shoulder darts and supplemented a back shoulder point due to the distorted shoulder shape of the subjects by cutting the shoulder point of the front bodice.

The difference according to somatotype in front and back armpits was related to the armhole circumference of the body, and the armhole circumference also indicated that the front armhole circumference was bigger than the back. Considering the difference in somatotypes, it was

essential to maintain a proper ease-amount in the armhole area. The waist areas of both the bending and the standard somatotypes required adjustment according to type.

Since the front neck depth is thick, the front neck width is narrow, and to the back neck height is low compared to the body, the area of the neck circumference had to be adjusted to the body. The ease of front and back interscye breadths had a lot of back interscye breadth, whereas the ease-amount varied according to measurement size. While the change in the back armpit from the bending somatotype appeared in the spread of the bent amount, the bent amount handling as a shoulder dart in the third experimental basic bodice varied slightly in somatotype according to the armhole circumference of the body. The back waist line area of the bending somatotype fitted appropriately by handling the shoulder dart as well. The position of the side seam line had a slight variation in accordance with the change of front and back interscye breadth, and the front, back, and side face were improved in appearance.

This study found that the chest circumference at scye was in accordance with the standard somatotype. While the chest circumference at scye ease of the standard somatotype increased depending on ease-amount and that of the bending and the turning over somatotype was reduced, the amount of cutting from front and

Table 3. The results of 1st, 2nd and 3rd sensory test on experimental basic bodices according to somatotypes

E. I	Bending Somatotype							Standard Somatotype							Turning over Somatotype						
	1st		2nd		3rd		F-test	1st		2nd		3rd		F-test	1st		2nd		3rd		F-test
	M	S.D	M	S.D	M	S.D		M	S.D	M	S.D	M	S.D		M	S.D	M	S.D	M	S.D	
1	2.80	.42	3.20	.42	4.00	.47	19.38***	3.10	.32	3.30	.48	3.80	.42	7.63**	2.80	.42	2.80	.42	4.00	.47	24.92***
2	3.10	.32	3.40	.52	4.00	.47	10.70***	3.30	.48	3.50	.53	4.20	.42	9.73***	3.00	.00	3.40	.52	4.00	.47	15.55***
3	2.90	.32	3.00	.00	3.40	.52	5.73**	3.20	.63	3.70	.48	4.00	.47	5.73**	2.90	.32	3.00	.00	3.80	.42	26.28***
4	2.80	.42	2.80	.42	3.40	.52	5.79**	3.20	.42	3.50	.53	3.60	.52	1.80	2.80	.42	2.40	.52	3.40	.52	10.69***
5	3.10	.32	3.20	.42	3.80	.42	9.44***	3.40	.52	3.80	.42	4.20	.42	7.71**	3.00	.00	3.00	.00	3.80	.42	36.00***
6	3.10	.32	3.20	.42	3.80	.42	9.44***	3.10	.32	3.20	.42	3.90	.57	9.50***	2.70	.67	2.60	.52	3.40	.52	5.76**
7	2.70	.48	2.80	.42	3.40	.52	6.34**	3.30	.48	3.80	.42	4.20	.63	7.52**	2.90	.32	3.20	.42	3.80	.63	9.30***
8	2.70	.48	2.80	.42	3.40	.52	6.34**	3.40	.52	3.80	.42	4.20	.42	7.71**	2.50	.53	2.80	.42	3.40	.52	8.72**
9	2.70	.48	3.20	.42	3.60	.52	9.00**	3.30	.48	3.60	.52	4.20	.42	9.30***	3.10	.32	3.20	.42	3.80	.42	9.44***
10	3.00	.00	3.40	.52	3.80	.42	10.80***	3.50	.53	3.80	.42	4.50	.53	10.77***	2.90	.32	3.00	.00	3.80	.42	26.28***
11	2.80	.42	2.80	.42	3.40	.52	5.79**	3.30	.48	3.30	.48	3.90	.32	6.35**	2.90	.32	2.80	.42	3.20	.42	2.85
12	2.90	.32	3.00	.00	3.80	.42	26.28***	3.40	.52	3.80	.42	4.30	.48	9.00**	3.00	.00	3.00	.00	3.60	.52	13.50***
13	3.10	.32	3.40	.70	3.80	.42	4.83*	2.90	.32	2.90	.32	3.50	.53	7.53**	2.70	.48	2.60	.52	3.20	.42	4.57*
14	3.20	.42	3.40	.52	4.00	.47	7.80**	3.20	.42	3.80	.42	4.50	.53	20.05***	3.10	.32	3.40	.52	4.00	.47	10.70***
15	2.90	.32	3.00	.00	3.40	.52	5.73**	3.10	.32	3.10	.32	3.50	.53	3.35	2.70	.48	2.60	.52	3.00	.00	2.60
16	3.30	.48	3.60	.52	4.40	.52	12.65***	3.50	.53	4.30	.48	4.60	.52	12.47***	2.80	.42	3.00	.00	4.00	.00	69.75***
17	3.40	.52	3.60	.52	4.20	.42	7.31**	3.30	.48	3.70	.48	4.10	.32	8.47**	3.20	.42	3.40	.52	3.80	.42	4.50*
18	3.10	.32	3.40	.52	3.80	.42	6.80**	3.30	.48	3.30	.48	3.80	.42	3.88*	3.00	.00	3.00	.00	3.80	.42	36.00***
19	2.80	.42	2.80	.42	3.60	.52	10.29***	3.10	.32	3.20	.42	3.70	.48	6.07**	2.70	.48	2.60	.52	3.00	.00	2.60
20	3.00	.00	3.20	.42	3.80	.42	14.63***	3.10	.32	3.20	.42	3.70	.48	6.07**	2.80	.42	2.80	.42	3.60	.52	10.29***
Total	2.97	.08	3.16	.11	3.74	.18	95.69***	3.25	.14	3.53	.12	4.02	.14	87.82***	2.88	.12	2.93	.07	3.62	.14	135.5***

E. I : Evaluation Items * p<.05, ** p<.01, *** p<.001

back interscye breadth made a difference of ease on side breadth. Even if the position of the armhole circumference turned out to be good by pulling 1.5cm downward from the waist line of the center front, the low score of the bending and the turning over somatotype from the back armhole region showed a somatical element.

Consequently, it was shown that a total significance level of $p<.001$ appeared with each somatotype, and that the third experimental basic bodices were the best for all somatotypes based on the sensory evaluations according to type.

2) Results of Functional Test and Clothing Pressure Measurement

The functional test as shown in Table 4 indicated that the third experimental basic bodices were easier and better than the second experimental basic bodices; and that the score difference according to motions was classified by the difference of ease-amount.

While motion 1 showed a difference for all somatotypes, motions 1 and 4 in the bending somatotype and motions 1, 3 and 4 in the standard and the turning over somatotypes appeared very different between the experimental basic bodices, due to the extent of material that goes up by pulling.

As a result of the clothing pressure test (Fig. 2), the second experimental basic bodices for all somatotypes indicated the highest pressure. Also, Fig. 2 showed that the bending somatotype had the least clothing pressure in the first experimental basic bodice, and that the standard and the

Table 4. The results of functional test (unit : score)

Motion	Bending Somatotype		Standard Somatotype		Turning over Somatotype	
	2nd * 3rd	3rd * 2nd	2nd * 3rd	3rd * 2nd	2nd * 3rd	3rd * 2nd
motion 1	3	−3	3	−3	3	−3
motion 2	0	0	0	0	3	0
motion 3	0	0	3	−3	3	−3
motion 4	3	0	3	−3	3	−3
Sum (score)	6	−3	9	−3	12	−9

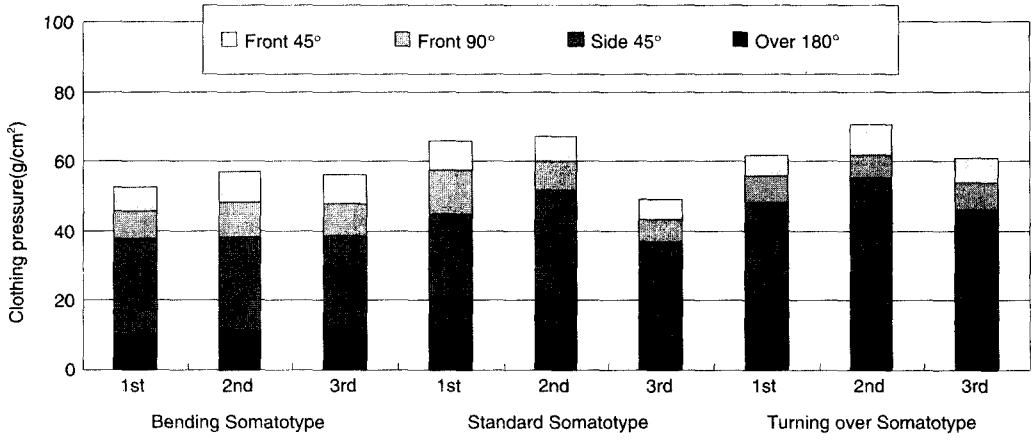

Fig. 2. The results of clothing pressure measurement according to somatotypes

turning over somatotype had the least clothing pressure in the third experimental basic bodices. In addition, looking at the stage of motions, the first experimental basic bodices represented the highest pressure but the most improvement at lifting 90° forward posture. The clothing pressure, exclusive of 180°, increased according to the angular movement of the arms, which was consistent with Joe's 1987 study reported on that increase at 45° and 90° representing a higher pressure in the front-lifting plane than the side-facing plane.

Futhermore, having markedly influenced the pressure of clothing, the ease amount was modified depending on the chest circumference at scye in the second experimental basic bodices, resulting in a great deal of progress in the third experimental basic bodices.

Therefore, the ease amount of the chest circumference at scye should be established to accommodate the measurement variables of chest circumference at scye in the designing pattern. It was reported that the more ease amount gains, the

Table 5. Comparative measurement for basic bodice pattern and formula (unit : cm)

No	Pattern measurement regions	Measurement of basic bodice pattern			Formular & Needed size
		type1	type2	type3	
①	Chest circumference at scye/2	53.20	55.00	60.50	B/2+(B/10-2cm)
②	Back chest circumference at scye/2	27.10	28.10	30.70	[B/2+(B/10-2)]/2+0.5cm
③	Front chest circumference at scye/2	26.10	26.90	29.80	[B/2+(B/10-2)]/2-0.5cm
④	Back interscye breadth	21.46	21.50	23.36	back interscye breadth/2+back interscye breadth/20
⑤	Side breadth	13.54	14.25	15.60	pattern measurement
⑥	Front interscye breadth	18.20	19.25	21.55	front interscye breadth/2+front interscye breadth/20
⑦	Back length	47.50	45.50	46.00	body measurement
⑧	Front length	49.30	49.00	50.50	body measurement
⑨	Back armpit	24.28	24.80	25.23	B/10+full length posterior/10
⑩	Front armpit	23.90	25.55	27.05	length difference+back armpit-1.5cm
⑪	Back neck height	2.56	2.64	2.89	B/36
⑫	Front neck depth	9.20	9.40	10.15	B/12+1.5cm
⑬	Back neck width	7.89	8.13	8.86	B/12+0.2cm
⑭	Front neck width	9.10	9.50	10.75	front interscye breadth/2
⑮	Back shoulder length	16(1.9)	15.89	15.89	(amount of dart)
⑯	Front shoulder length	14.01	15.11	15.20	pattern measurement
⑰	Back shoulder width	22.65	22.62	24.55	back interscye breadth+1.2cm
⑱	Front shoulder length	21.40	22.15	24.40	pattern measurement
⑲	Back shoulder drooping	5.00	5.00	4.80	[back neck height + back neck width/3] - 0.5cm
⑳	Front shoulder drooping	6.00	6.50	7.30	[back neck height + back neck width/3] + 0.5cm
㉑	Back shoulder slope	19.43	19.50	17.30	pattern measurement
㉒	Front shoulder slope	23.32	25.35	26.32	pattern measurement
㉓	Back armhole circumference	25.50	25.80	26.60	pattern measurement
㉔	Front armhole circumference	24.07	25.40	28.30	pattern measurement

lesser the pressure of clothing, and the easier the function seemed to be. Also, the functional test and pressure of clothing were influenced by ease amount, and the research on body structure and motion enables us to create functional clothing.

2. Construction of Basic Bodice according to Somatotypes

Based on the above results, patterns for the basic bodice according to somatotypes were selected.

The necessary measurements were the full length posterior, the back length, the front length, the front interscye breadth, the back interscye breadth, and the chest circumference at scye.

The part of the chest circumference at scye was set as[(chest circumference at scye/2+chest circumference at scye/10)], which included 10% of the chest circumference at scye size as the ease-amount. The back armpit set up [(chest circumference at scye/10+full length posterior/10)]. The shoulder length posterior needed [back interscye breadth/2+1.5cm] and the back shoulder length added 0.6-1cm for volume disposal of scapula area.

The front interscye breadth was [front interscye breadth/2+1.6cm], while the back interscye breadth was [back interscye breadth/2+2cm]. It was possible to overcome the somatotype distinction by pulling down the front length by 1.5cm under the waist circumference line, making the front armpit depth shorter and longer than the bending and the turning over somatotypes respectively. The application of measurement to shoulder slope was very difficult not only because the shoulder slope was affected by the depth of the body, but because of the difference between the shoulder slope of the body and the measurement of the pattern. Accordingly, front shoulder drooping was set up as [back neck height+back neck width/3-0.5cm] and back shoulder drooping was set up as [back neck height+back neck width/3+0.5cm].

Based on the above research, drawing methods for men's basic bodice patterns were set up and 〈Fig. 3〉 suggested the pattern measurement regions (Table 6) of basics bodice according to somatotypes and basic bodice patterns for each

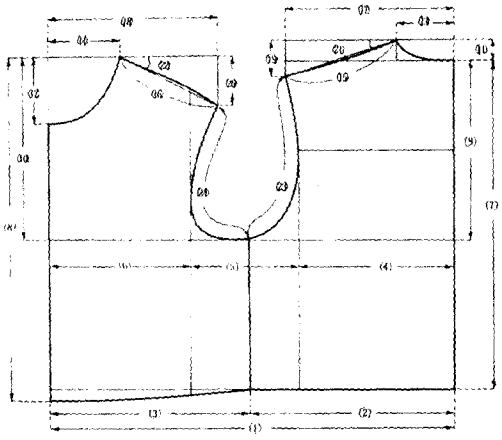

Fig. 3. Measurement regions of basic bodice pattern according to somatotypes

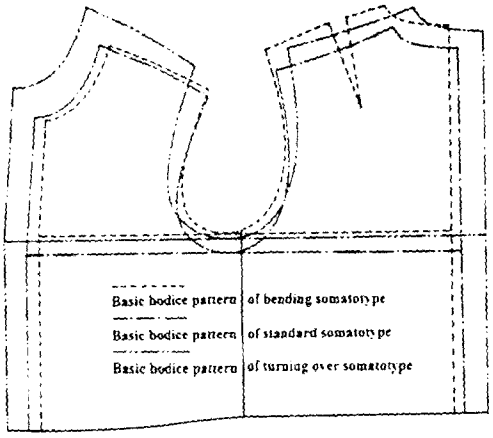

Fig. 4. Doubling layer drawing of basic bodice pattern according to somatotypes

somatotype in 〈Fig. 4〉 using a doubling layer drawing.

IV. Conclusion

In this research, subjects with a distinctive somatotype were categorized into the bending somatotype, the standard somatotype, and the turning over somatotype by random sampling, In addition' a sensory evaluation, functional test, and clothing pressure test were conducted at each stage for the respective subjects with manufactured clothing. Through correction and modification, men's basic bodice patterns for somatotypes were provided. The findings are as follows:

1. As a result of the wearing evaluation, physical characteristics were shown to be an important factor affecting the shift of individual pattern type. The standard somatotype reported a relative fit, while the bending somatotype presented a bending at the back region and projection at back interscye breadth and back length, and the turning over somatotype showed front interscye and front length as well. Somatotype difference appeared to contribute to the fact that armpits affected two somatotypes with the least influence of chest circumference at scye. Ease amount added a measurement variable of chest circumference at scye which increased proportionally as the measurement variable did. Therefore, the ease of chest circumference at scye should be set up with a change of chest circumference at scye in the designing pattern.

2. The measuring items for drawing a basic bodice pattern included full length posterior, back length, front length, chest circumference at scye, front and back interscye breadth. Neck depth and width employed chest circumference at scye whereas armhole circumference used chest circumference at scye and full length posterior. Additionally, according to measurement variables, front interscye breadth and back interscye breadth were constructed while shoulder length posterior employed back interscye breadth.

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