

A Research on the Somatotypes of Female College Students

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Abstract : The object of this research was to observe the female college 220 students of aged 19-24 for four years and to examine somatotypes distribution; this research intends to contribute to the fitness of clothes by studying the body distribution that affects the clothing structure. The measurement and wearing experiment for somatotypes are done years annually. The average, standard deviation and coefficient of variation was calculated by the SAS program. The research results are as follows: The three somatotypes of side view silhouette (straight type, bend-forward type, lean-back type) showed fairly even distribution. As a result of dressing experiment with the basic bodice pattern, the most influential factor on its suitability was found to be the neck area, shoulder and ease of bodice respectively. The partial body types to observe were categorized as: shoulder (normal, slope, squared), bust (A cup, B cup, C cup), hips (normal, droop, projecting). As for the result for full body type by BMI, normal type was most dominant, and for the categorization by drop, the type A which is with small breasts and large hips was most prevalent.

Key Words : suitability of pattern, distribution of side view somatotypes, full body type, partial body type

I. Introduction

Korean government had measured human body since 1979 to 2004. Those 25 years of main measurement showed that height, weight and waist of both sex had increased for every age group indicating the improvement of human structure of physique (The Digital Times, 2004) throughout the period. A form of body, distinct to physique, differs considerably among individuals in terms of by the size of their build, development of muscles and distribution of the subcutaneous fat, with all these decided by the genetic effects or the nutritive conditions. Research of changes of Korean's body types indicates that people had been increasingly westernized resulting the face getting smaller and the height getting taller (Technology

Standard, 2004).

Over the past years, many studies including medical science and anthropology have been researching a lot about classification of somatotype. Many research data were analyzed and also two independent systems of Clothing Construction & Clothing Ergonomics, have been attempting to observe and divide the somatotypes. In their academic areas, rational connection between clothes and human is being studied, and also by learning the precise information about human body's size, form and posture, human body's measurement has been carried out in many ways. By knowing the advantages and disadvantages of each measuring ways, the measuring method and items could be selected to be useful for the purpose of the body's information. By looking at the research of somatotypes for clothing

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construction, in the beginning, many researches were made by simple basic statistics depending on different form of body according to age and sex, however with the development of skills for body observation and measurement method, there has been researched using photographic measurement through silhouetter or three-dimensional viewing ways by using plaster bandage method and Moiré photography method to understand the form. In research of the factor front and side position of young Korean women through the three-dimensional form data, analysis showed that there were unbalance of form and change of distinct position was found that the side actually forwarded more than the fiducial line (Size Korea, 2004). In this research, preceding studies on classification of somatypes were considered. It is specified in three parts, which are somatypes of side view silhouette, full body type and partial body type.

Unbalance of partial body types and right-left sides has been the cause for the unfitting of clothes such as uncomfortable neck area, awkward by difference of waist back length and center front length, while effecting the suitability and fitting condition also. College women aged of 19 through 24, experimenting in series of actual pattern making class, had been observed yearly for 4 years, to find out how their body distribution can effect clothing construction and finally with its result it will help improve the suitability of clothes.

II. Method and Procedure

1. Subject and measuring

In this research, 220 college women aged of 19 through 24 organized with none of them over (BMI 30 and more) or underweight (BMI 18.5 and less). The measurement and experiment took place in sophomore's pattern producing class, for 4 years annually. Numbers of subject in the research were 55, 61, 51, 53, each year beginning from year 2001 to 2004. The body measuring was one-dimensionally done, with using Martin's

instruments, while measuring tape, scale, elastic cord and pen were used as the assistant tool in such use of indicating the waistline or to mark a datum point. The measuring items totaled to 21 items, which are 11 lengths, 5 circumferences, 3 breadths and 1 height and weight. The measurement was followed the ways which were set up by Industry Development Office's body measuring terminology and method that are known as the KS A 7003 and KS A 7004.

The average, standard deviation and coefficient of variation were calculated by the SAS program. Since this research had been a longitudinal study for 4 years, in order to compare this with other groups' data, was calculated CV. The higher CV, the variability is, the more variation among average exist. According to the calculation result, there were no significant difference among groups, and therefore it would be reasonable to compare them.

2. Classification of somatypes

The forms were divided at the side, parts and full body type, due to how they affect the manufacturing of the basic bodice pattern, the sizing and observed results. In the side view forms, straight, bend-forward and lean back type were applied just like the preceding study (Kwon, 1997; Nam, 1984). Because turning over type was difficult to distinguish visually, 3 types were categorized. Also It was divided into 3 parts through observation and analysis of the wearing test on basic bodice pattern. To examine the suitability, wearing test with experimental clothes produced by the experiencing person's size was done. The division of partial and full body type was sorted like the preceding methods (Armstrong, 1995). Shoulder, bust and hip areas were observed and divided by BMI and drop value. With this standard, the wearing experiment and visual result of the BMI $((\text{kg})/\text{height}^2(\text{m}^2))$, individual's drop value (difference between the circumference of bust and hip) and the body size were applied. In the clothing construction room, observation of body type annually

took place with the same conditions.

3. Basic bodice pattern for experiment

The wearing experiment was done through clothing which was made with the basic bodice pattern produced by the muslin (cotton 100%, warp density 65 strips/in, weft density 61 strips/in, thickness 0.331 mm, weight 156.2 g/m²) in matching of subject's size. After reviewing the first experiment's error, it took place again after the correction is made. The drafting of the basic bodice pattern was method of Jeon & Kwon (Principles of pattern making, 2000).

The measuring, with the researcher overseeing, had two experiencing people grouped, and was used the average of 3 measurement to have the smallest error range. The researcher closely examined to check if it is accurately done after drafting.

III. Results

In this research 220 college students were observed annually 55, 61, 51 and 53 each for 4 years. It was

divided and sorted by the body parts which affects the making of clothes. It was observed for 4 years, from 2001 to 2004, to have the range of the college women's actual body types, through wearing test, calculating the measurements, and observing the body during the pattern making. If fitness is needed for the clothes, the more information about the body is needed. The side view silhouette is affected the most for the fitness of basic bodice pattern. Sixty six percent of unfitness in the neck and shoulder part was shown at the wearing of basic bodice pattern. The subjects, college women were divided in to 3 somatotypes of side view silhouette. According to these parts, suitability of neck and shoulder part of basic bodice pattern were different. With a little adjustment at the neck part of the basic pattern there were a lot of differences in the increase of fitness.

Like the <Table 1>, by calculating coefficient of variable to prove the appropriate comparison of the average with important measurement, it was compared with other group to get for 4 years. The average, standard deviation and coefficient of variable were calculated by the SAS program. Every year there was an increase in the length items including the height. In the 5th Korean body size researched work (Size Korea, 2004), Korean

<Table 1> Coefficient of variable on yearly measurement

Item	Year			2001			2002			2003			2004		
	Value	M	S.D	C.V	M	S.D	C.V	M	S.D	C.V	M	S.D	C.V		
Waist back length		37.3	2.8	7.2	37.6	2.9	7.4	37.9	3.1	7.7	38.1	3.3	7.9		
Back chest breadth		35.6	2.5	7.0	35.5	2.9	7.5	36.0	3.7	8.0	35.7	3.8	8.5		
Shoulder length		12.8	1.3	10.1	12.7	1.2	9.4	12.9	1.4	10.3	13.0	1.3	10.0		
Bust circumference		81.7 (80.5) ^a	4.2 (3.9)	5.2 (4.8)	82.2 (81.1)	4.9 (4.2)	5.4 (5.2)	82.5 (80.9)	3.7 (4.1)	4.9 (4.9)	82.4 (81.0)	3.1 (3.8)	4.0 (4.5)		
Underbust circumference		70.1	3.9	5.5	71.0	3.1	4.4	70.8	3.5	4.9	71.0	3.3	4.6		
Waist circumference		66.0	3.9	5.9	65.7	3.1	4.7	66.1	3.7	5.5	66.5	3.8	5.6		
Hip circumference		89.5	3.4	3.7	89.2	3.5	3.6	89.4	3.7	4.1	89.9	3.4	3.9		
Waist front breadth		31.1	1.9	6.1	31.7	2.0	6.3	30.9	1.7	5.5	31.2	2.1	5.9		
Center front length		31.1	2.7	8.3	31.4	2.5	8.0	31.8	2.7	8.2	31.7	3.0	8.7		
Weight		54.9	5.8	10.1	54.5	4.1	7.5	54.4	4.3	7.9	54.7	4.1	7.5		
Stature		160.3	3.9	3.9	160.7	3.7	3.7	161.7	3.8	3.5	162.1	3.9	3.4		

^a () : in case of not wearing brassiere

<Table 2> Observation of somatotype of side view silhouette by the wearing test

Year	Somatotype	N (%)		
		Straight Type	Bend-Forward Type	Lean-Back Type
2001		20(36%)	15(28%)	20(36%)
2002		20(33%)	23(37%)	18(30%)
2003		14(27%)	20(39%)	17(34%)
2004		18(35%)	17(32%)	18(33%)
Total		72(33%)	75(34%)	73(33%)

<Table 3> Unfitness of basic bodice pattern through wearing test

Year	Part	N (%)		
		Neck	Shoulder	Ease of Bodice
2001		35(64%)	13(24%)	11(20%)
2002		42(69%)	15(25%)	12(20%)
2003		34(71%)	8(17%)	9(19%)
2004		23(58%)	10(27%)	11(28%)
Total 220		134(66%)	38(19%)	31(15%)

women in the twenties had serious disproportion on their bodies. Similarly in this result, bodies of the college women had various body types for most of them.

1. Observed result about somatotype of side view

The somatotype of side view was researched together with the visual observation and analysis of the suitability of the basic bodice pattern used during class, and with the three predictable somatotypes, like the result of the previous research, there was an unsuitability in the parts of neck and shoulder, while there were difference in the lengths of the waist front and back of each forms. Three somatotypes (straight, bend-forward, lean-back) were pretty much equally distributed like <Table 2>. This result was not very different from the previous research. The observation made by the wearing of the basic bodice pattern to see the unfitness is shown at <Table 3>, with the neck part

showing evident unsuitability and this unfitness showed in orders of shoulder and then ease of the body. When the shoulder was not matching, the armhole area was also not fit. The neck area showed the most difference among the each types, while the shoulder and armhole area were unfit by the difference of gradient of an individual's shoulder. In the ease of body pattern, according to the fleshiness of the body, if there are more, they have a tendency to measure tight, so for a person who is overweight showed a tight fit. However for a person who is under weight, the evaluation was made for the fitness with relatively enough ease. In the straight type, there was lean-back type the difference was larger or lesser. '6 cm' is the explanation based on experimental result. Based on drafting and wearing test result, 6 cm difference was generally observed from straight difference of 6 cm of distribution between the waist front and back, while in the bend-forward and straight type, and we took it as a reference point. In other words, if one has a good posture, the waist front and back difference is about 6 cm. In case of <Table 1>, difference of the center front and waist back length is 6.2 cm. According to the average values, they tended to be forwarded posture.

For the neck area, the bend-forward type and lean-back type showed the opposite results each other. For the bend-forward type, the back neck area was tight and the position of front neck point was higher, whereas the width of front neck area was loose and their depth was shallower for the lean-back type. Bend-forward type had tendency to have narrower necks and shoulder, while the

<Table 4> Average Measurements of 3 Side View Somatotype (cm)

Measurement \ Type	Straight Type	Bend-Forward Type	Lean-Back Type
Waist back length	37.5	39.1	36.1
Center front length	31.5	32.1	31.8
Back neck width	7.2	7.7	6.9
Back neck depth	2.4	2.6	2.2
Front neck width	7.7	7.5	7.9
Front neck depth	8.0	7.3	8.3
Shoulder length	12.6	11.9	13.2

lean-back type showed wider shoulders. With the neck area modified, the pattern showed enhancement in its suitability.

2. Observed result for somatotype of partial body

After observing the result of three-dimensional image of unequal body form of women in the twenties, it was viewed by projecting abdomen, shoulder dissymmetry, pelvis dissymmetry, and turtle neck, the 4 types of body

forms, and only 8% of subject showed well-balanced (Size Korea, 2004).

In the result of this research, observation was made through shoulder (normal, slope, squared), bust (A cup, B cup, C cup), hip (normal, droop, project) and by asking subject (ex. brassiere size, symmetry of bust, balance of hip..). The wearing experiment and visual observation was conducted to the shoulder and hip areas, while the cups of the bust were divided by the difference between the circumference of the bust and the under bust part (A cup was under 10 cm, B cup 12.5 cm, C cup 15 cm). Measuring after each subject wore 2 of their brassiere, it showed difference of 0.8~1.1 cm. Depending on the differences whether the brassiere was put on or not, their circumference of the chest showed difference of 1.1~1.6 cm. The brassiere cups were mostly included to A cups which has the difference of under 10 cm, between the circumference of the chest and under chest. The right-left hip dissymmetry was observed by wearing the panty tights. The dissymmetry of right-left of the subject's shoulder was 51%, bust 16% and hip 7%. Because the brassiere was put on, the dissymmetry of the bust was just asked to the subjects. The dissymmetry was mostly shown in the order of shoulder, bust, hip,

<Table 5> Observed Result of Should, Bust and Hip

Part	Year					N (%)
		2001	2002	2003	2004	Total
Shoulder	Normal	40	48	44	31	160(73%)
	Slope	8	7	4	12	23(10%)
	Squared	7	6	3	10	20(9%)
	Total	55	61	51	53	220
Bust	A Cup	33	39	30	31	130(59%)
	B Cup	19	20	17	18	63(29%)
	C cup and more	3	2	4	4	10(5%)
	Total	55	61	51	53	220
Hip	Normal	34	39	31	35	133(60%)
	Droop	10	10	7	8	33(15%)
	Project	11	12	10	10	37(17%)
	Total	55	61	51	53	220

<Table 6> Right-Left Dissymmetry Distribution of Shoulder, Bust and Hip

		N (%)				
Part	Year	2001	2002	2003	2004	Total
	Shoulder		25	31	33	23
Bust		9	11	8	8	36(16%)
Hip		2	5	5	4	16(7%)

while the reason for the shoulder seems to be coming from the living habit such as wearing heavy bags, and no particular reason was found for the dissymmetry of chest and hip. Over twenty percent subjects did not showed any signs of dissymmetry.

3. Observed result for full body type

Full body types were divided by BMI (18.5 and less underweight, 18.5~22.9 normal, 23.0~30.0 obesity) and drop value. The BMI was fixed by height and weight, while drop value was decided by difference of bust and hip circumference. According to BMI,

normal type was predominant in this research, different to the research that showed edge for the underweight type of college students in Seoul. Distribution through drop value showed much more number for the A type than other types did, which had small bust and larger hip. It was contrastively different that Y type women in elder ages were predominant (Size Korea, 2004). Even though the standard was made through BMI index and drop value, observation of the visual research was also studied. In the distribution of difference between the circumference of the hip and waist (25 and less: slim waist, 18~24: normal waist, 10~17: thick waist), 24% of subject were divided to thick waist.

<Table 7> Classification of Body Type by BMI and Drop

		N (%)				
Types	Year	2001	2002	2003	2004	Total
	BMI	Underweight (18.5 and less)	8	12	10	8
Normal (18.5~22.9)		38	42	35	32	150(68%)
Fat (23.0~30)		9	7	6	13	30(14%)
Total		55	61	51	53	220
Drop I ^a (B-H)	N type	19	21	16	16	71(32%)
	A type	21	27	26	22	100(45%)
	H type	15	13	9	15	49(22%)
	Total	55	61	51	53	220
Drop II ^b (H-W)	Normal Waist	20	22	18	28	86(39%)
	Slim Waist	23	25	20	13	82(37%)
	Thick Waist	12	14	13	12	52(24%)
	Total	55	61	51	53	220

^a Drop I: Difference of bust and hip circumference

^b Drop II: Difference of hip and waist circumference

IV. Discussion and implications

The basic bodice pattern used on this study was designed as the straight body form as the standard, even though the subject have different body type each other. Therefore the research had to show unsuitability of the divided somatotypes. With the body type's information, the unsuitability will be corrected. Also most of subjects had different body types and there were no signs of relationship between them, so it was hard to justify the form into one conclusively. The lateral body shape affects the suitability of the bodice pattern. The female college student subjects showed a fairly even distribution among the three body types. The suitability of the bodice pattern for the neck and shoulder areas observed to be different according to different types of the side view body shapes. It would be desirable that the lateral body shape be considered in the pattern construction particularly for the clothes requiring delicate suitability. The distribution among the three types (straight type, bend-forward type, and lean-back type) turned out to be fairly even.

In the dressing experiments of the bodice patterns, the lacking fitness of the neck and shoulder area were observed among the bend-forward type and the lean-back type. Other than that, there observed no consistent difference according to the body types. To increase the satisfaction of one's clothes, information of the real body should be applied and fixed to improve the suitability. In this research, only one method of basic pattern making was tested to evaluate the unfit, so there is a need to study many other patterns. Like this research, by knowing the body form and its distribution, there will be increase in the patterns for body's composition, and therefore it will be more effective and aesthetic to produce clothes. And because the measurement of this study was limited to parts for pattern making, significant change of body type or physique was not found. However, researching with this method for 4 years, with the variety of body type existing in every group, it is a very important key element in making clothes. In other

words, not only accurate measurement was important, but visual observation and classification of body type through this study was also very meaningful. Especially, with the distribution of side view silhouette being consistent for the past 4 years, applying basic bodice pattern to each parts in making clothes, it has become an important point in improving fitness. And also the information of the body type will become an important reference in making clothes classified by item. In the future the researcher will continue with the study to improve the fitness of clothes by applying the basic bodice pattern according to somatotypes. It is assumed that due to the limitation of the measured items in the research there has not been much variation in the data over the four years.

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