

A Study on the Comparison of Body Types between Chinese and Korean College Women

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Abstract

The research analyzes characteristics of body types for the Chinese women based on the different life style and to compare the differences of body type with Korean women. The measurement had took in Beijing and Seoul in 1999.

As a result of comparing Chinese and Korean women's body measurements, it was found that Chinese women are shorter and obser than Korean women. Besides, chinese arms and upper body are shorter, and their body is thicker compared with their relatively narrower breadths. In other words, their body volume is deeper than Korean women who have relatively flat chest. After all, Chinese women's chests are more voluminous, while their shoulders are drooped more, although their shoulder size is almost as same as Korean women'.

By using factor analysis, 8 factors were extracted from body measurements: body obesity, vertical body size, ankle and knee sizes, head size, front upper body length, shoulder size, form and size of neck and upper chest, drooping of shoulders, and size of hip. It was found that Chinese college women are obeser with larger vertical body length and front upper body length. And their shoulders are more drooped with larger hip. But two nations' female students did not show any differences in the sizes of ankles, knees, head and shoulders.

Key words : body type, body measurements, factor analysis.

I. Introduction

Recently, Chinese market has been reputed highly for its potential of leading the world

market. Particularly for Korea whose domestic market has been diminishing, the Chinese market emerges rapidly as an important export market. Despite Chinese rapid economic growth and great growth potential

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as well as geographic and cultural affinity between China and Korea, Korean apparel exporters have a long way to go to be established in the most populated market. Merely, since 1992 when the China-Korea diplomatic relation was established, the trade between two nations has grown, while Korean apparels have been exported with a limited success only. Namely, most Korean apparel brands but several ones have failed to advance into the Chinese market due to lack of the information on the Chinese apparel market or poor understanding of it. In particular, the biggest problem involves the poor adaptability of Korean apparel brands to Chinese consumers' body types, which must require an urgent measure to solve the incongruity between Chinese and Korean consumers' body types.

Hitherto studies of body types have focused on differences in physical traits coming from differences in age and classification of body types^{1,2,3,4,5}, and diverse researches are being conducted in those fields. However, comparative studies of physical traits according to different geographical, ethnic and social environment remain insufficient.

Under such circumstances, this study was aimed at surveying the body types of Chinese and Korean college women - who are thought to have a relatively ideal constitutional proportion as they are fully grown up - and thereupon, comparatively reviewing their body types, and thereby, providing for the basic data useful to Korean apparel exporters

who want to develop their apparel commodities adapted to Chinese women consumers' body types.

II. Survey Method

1. Sample

By random sampling, each 100 Chinese and Korean college female students between the ages of 17 and 24 were selected as the subjects. Anthropometric survey was conducted 1999 in Beijing in China and Seoul in Korea between January 13-April 20.

2. Method and Category of Anthropometric Survey

1) Method of Anthropometric Survey

The anthropometry was based on R. Martin's method, and standard lines and standard points coincide with those in the National Anthropometric Survey of Korea⁶. The subjects were wearing brassieres and drawers, and standing upright the toes spreading 45° apart.

2) Categorys of Anthropometric Survey

There were 72 anthropometric categories in which 14 are relating to stature, 14 are relating to length, 14 are relating to breadth, 12 relating to depth, 15 relating to circumference, 2 relating to degree and 1 relating to weight as listed in (Table 1).

¹ Hee-Soon Sohn, A study on body types and the establishment of the standard sizes for Korean middle aged women's ready-to-wear clothes, Ph. D. dissertation, Graduate School of Sookmyung Women's University, 1989.

² Hee-Jeong Son, , The study of classification body types of adults women and drawing of prototype of clothing, Ph. D. dissertation, Graduate School of Sookmyung Women's University, 1994.

³ Soon-Ja Kim, Classification of upper torso somatotype on middle aged women for dress form, Ph. D. dissertation, Graduate School of Yonsei University, 1992.

⁴ Yun-Ja Nam, A study on classification of somatotype based on the lateral view of women's upper body, Ph. D. dissertation, Graduate School of Seoul National University, 1991.

⁵ Myung-Sook Jung, Classification of somatotype and its characteristic according to the age group of adult female, Ph. D. dissertation, Graduate School of Seoul National University, 1994.

⁶ National Anthropometric Survey of Korea, Korea Research Institute of Standards and Science, National Institute of Technology and Quality(NITAQ), 1997.

<Table 1> Comparison of Chinese and Korean in anthropometric measurements (cm)

| | Item | Chinese | | Korean | | t-value |
|---|------------------------------------|---------|-----|--------|-----|---------|
| | | Mean | S.D | Mean | S.D | |
| | Stature | 158.4 | 5.3 | 161.0 | 5.2 | 3.5*** |
| | Gnation height | 135.6 | 5.1 | 138.3 | 5.2 | 3.7*** |
| | Neck height posterior | 134.2 | 4.9 | 136.5 | 5.0 | 3.1** |
| | Neck height side | 133.3 | 4.9 | 135.6 | 5.0 | 3.3** |
| H | Neck height anterior | 129.3 | 4.8 | 130.8 | 4.9 | 2.3* |
| E | Acromion height | 128.2 | 4.9 | 131.3 | 5.1 | 4.5*** |
| I | Nipple height | 112.6 | 4.7 | 115.2 | 4.7 | 3.8*** |
| G | Waist height | 98.7 | 4.2 | 100.0 | 4.1 | 2.0* |
| H | Hip height | 78.7 | 3.9 | 78.8 | 4.2 | 0.2 |
| T | Perineum height | 71.5 | 4.0 | 73.8 | 3.8 | 4.2*** |
| | Wrist height | 76.9 | 3.3 | 79.6 | 3.1 | 6.0*** |
| | Fingertip height | 60.4 | 3.3 | 63.3 | 4.8 | 5.0*** |
| | Tibial medial height | 42.7 | 2.6 | 43.7 | 2.8 | 2.5* |
| | Ankle height | 6.2 | 0.5 | 6.7 | 1.0 | 4.9*** |
| | Shoulder length | 12.5 | 0.8 | 12.3 | 1.2 | -0.9 |
| | Shoulder to shoulder length | 38.0 | 1.7 | 37.6 | 2.2 | -1.4 |
| | Neck side to nipple length | 25.4 | 1.5 | 25.0 | 1.6 | -1.9 |
| | Neck side-nipple-waist line length | 41.1 | 1.7 | 40.2 | 2.1 | -3.6*** |
| L | Waist front length | 33.4 | 1.6 | 31.7 | 1.8 | -7.0*** |
| E | Waist back length | 37.3 | 1.4 | 38.6 | 2.0 | 5.3*** |
| N | Arm scye length | 17.4 | 1.1 | 17.2 | 2.0 | -1.0 |
| G | Front interscye length | 33.0 | 1.7 | 31.6 | 1.9 | -5.7*** |
| T | Back interscye length | 35.9 | 1.7 | 35.1 | 2.1 | -2.8** |
| H | Elbow length | 30.9 | 2.0 | 32.0 | 2.1 | 4.1*** |
| | Arm length | 52.6 | 2.9 | 55.2 | 3.1 | 6.3*** |
| | Gluteal length | 31.0 | 1.8 | 30.6 | 2.2 | -1.5 |
| | Waist side-hip line length | 21.9 | 1.7 | 22.3 | 2.1 | 1.6 |
| | Crotch length | 68.6 | 3.0 | 69.9 | 3.8 | 2.7** |
| | Head breadth | 15.8 | 0.6 | 15.6 | 0.9 | -2.1* |
| | Neck root breadth | 12.3 | 0.7 | 12.2 | 1.4 | -1.0 |
| | Acromion to acromion breadth | 34.2 | 1.4 | 33.7 | 1.7 | -2.1* |
| B | Maximum body breadth | 40.7 | 2.3 | 39.6 | 2.9 | -3.0** |
| R | Upper chest breadth | 26.3 | 1.6 | 27.2 | 1.9 | 3.6*** |
| E | Nipple to nipple breadth | 17.3 | 1.3 | 16.5 | 1.4 | -4.1*** |
| A | Chest breadth | 25.8 | 1.4 | 25.9 | 1.7 | 0.7 |
| D | Under chest breadth | 24.2 | 1.2 | 24.7 | 1.5 | 2.8** |
| T | Waist breadth | 22.2 | 1.4 | 23.3 | 1.5 | 5.3*** |
| H | Abdomen breadth | 29.4 | 1.9 | 28.8 | 1.6 | -2.4* |
| | Hip breadth | 32.3 | 1.4 | 32.0 | 1.6 | -1.4 |
| | Thigh breadth | 15.3 | 0.9 | 15.6 | 1.4 | 1.7 |
| | Knee breadth | 10.5 | 0.7 | 10.2 | 1.1 | -2.8** |
| | Ankle breadth | 5.3 | 0.6 | 5.9 | 0.8 | 6.3*** |

<Table 1> Continued

| Item | Chinese | | Korean | | t-value | |
|------|---------------------------|------|--------|------|---------|---------|
| | Mean | S.D | Mean | S.D | | |
| | Head depth | 18.1 | 0.7 | 18.1 | 1.2 | -1.1 |
| | Neck root depth | 10.7 | 0.7 | 10.5 | 1.2 | -0.9 |
| | Arm scye depth | 10.6 | 0.9 | 10.4 | 1.9 | -0.8 |
| D | Upper chest depth | 19.0 | 1.5 | 17.9 | 1.4 | -5.4*** |
| E | Chest depth | 21.6 | 1.7 | 20.8 | 1.8 | -2.9** |
| P | Under chest depth | 18.6 | 1.6 | 17.3 | 1.6 | -5.7*** |
| T | Waist depth | 16.9 | 1.4 | 16.4 | 1.5 | -2.3* |
| H | Abdomen depth | 19.9 | 1.8 | 18.8 | 1.8 | -4.7*** |
| | Hip depth | 20.9 | 1.5 | 20.7 | 1.6 | -1.0 |
| | Thigh depth | 15.7 | 1.2 | 15.8 | 1.5 | 0.2 |
| | Knee depth | 10.7 | 0.6 | 10.4 | 1.0 | -2.2* |
| | Ankle depth | 6.9 | 0.5 | 7.3 | 0.9 | 3.4*** |
| | Head circumference | 55.9 | 1.3 | 55.8 | 1.4 | -0.1 |
| C | Neck root circumference | 37.7 | 1.8 | 38.9 | 2.3 | 4.1*** |
| I | Upper chest circumference | 83.5 | 4.1 | 81.4 | 4.5 | -3.4*** |
| R | Chest circumference | 83.7 | 4.6 | 82.0 | 5.1 | -2.4* |
| C | Under chest circumference | 72.6 | 4.3 | 72.1 | 4.3 | -0.7 |
| U | Waist circumference | 67.1 | 4.3 | 66.3 | 4.6 | -1.2 |
| M | Abdomen circumference | 80.3 | 6.5 | 78.6 | 5.5 | -2.0* |
| F | Hip circumference | 91.7 | 4.4 | 90.6 | 4.3 | -1.7 |
| E | Arm scye circumference | 37.4 | 2.6 | 38.1 | 2.9 | 1.7 |
| R | Upper arm circumference | 27.8 | 2.3 | 26.3 | 2.4 | -4.5*** |
| E | Elbow circumference | 22.4 | 1.3 | 22.1 | 1.3 | -1.8 |
| N | Wrist circumference | 15.1 | 0.8 | 14.8 | 0.7 | -3.0** |
| C | Thigh circumference | 54.3 | 4.1 | 53.1 | 3.9 | -2.2* |
| E | Knee circumference | 35.4 | 2.1 | 35.0 | 2.3 | -1.1 |
| | Ankle circumference | 23.5 | 1.3 | 24.0 | 1.3 | -2.2 |
| DEG- | Shoulder left angle(°) | 22.9 | 3.6 | 21.7 | 3.1 | -2.5* |
| REE | Shoulder right angle(°) | 23.9 | 3.9 | 22.1 | 3.2 | -3.6*** |
| | Weight(kg) | 52.1 | 6.1 | 51.9 | 6.3 | -0.2 |
| | Rohrer index | 1.3 | 0.2 | 1.2 | 0.1 | -3.3** |

* p<.05, ** p<.01, *** p<.001

3. Data Analysis

The collected data were processed using the SAS statistical program for means and standard deviations to determine the differences of body types between Chinese and Korean college women as well as for t-test to verify the statistical significance. Furthermore, in order to determine the factors comprising the body types of two fe-

male student groups, factor analysis was conducted, and thereupon, t-test was performed to test the differences among factors scored.

III. Results and Discussion

1. Comparative Review of Body Measurements

In order to review the differences of body types between Chinese and Korean women 72

body measurements were statistically processed for means and standard deviations and thereupon, were subject to T-test. As shown in (Table 1), 47 measurements of them were found different significantly between two groups.

To be more specific, there were significant differences of heights except hip height between two groups. That means, Korean female students had larger heights than their Chinese counterparts, who had 2.5cm or smaller heights on average: stature(-2.6cm), acromion height(-3.1cm), nipple height(-2.6cm), wrist height(-2.7cm), fingertip height(-2.9cm). In contrast to such overall differences of the vertical body measurements, Chinese college female students had the average waist height 1.3cm smaller than Korean students, while there was no significant difference of hip height between two groups of female students. In all, such findings suggest that the Chinese college women have a larger lower-body height compared with their stature.

On the other hand, in 8 length items out of the total 14 ones, significant differences were found between two groups. That is, there were no significant differences in such lengths as shoulder length, shoulder-to-shoulder length, neck-side-to-nipple length, arm scye length, gluteal length, waist side-hip line length, while Korean college female students had smaller lengths of waist front(-1.7cm), neck side-nipple-waist line(-0.9cm), front interscye (-1.4cm), back interscye(-0.8cm), etc., and larger lengths of waist back (+1.3cm), elbow(+1.1cm), arm(+2.6cm) and crotch(+1.3cm) than Chinese college female students. In all, it can be said that there is no difference of shoulder size between two groups, but those Chinese female students have a larger waist front length and a smaller waist back length, which suggests that the Chinese women have a body type pulled back more than the Korean women.

The two groups had shown significant dif-

ferences in 10 breadth items out of 14 ones excluding such breadths as neck root, chest, hip and thigh. While the Chinese group had larger measurements of such breadths as maximum body (+1.1cm), nipple-tonipple(+0.8cm), abdomen(+0.6cm), they had smaller measurements of such breadths as upper chest(-0.9cm), waist(-1.1cm) and ankle (-0.6cm) than their Korean counterparts.

There were significant differences of 7 depth measurements out of 12 ones except such depths as neck root, head, arm scye, hip and thigh. The Chinese women had shown larger measurements in such depths as upper chest(+1.1cm), chest(+0.8cm), under chest (+1.3cm), abdomen(+1.1cm) and waist(+0.5cm), but had shown smaller measurements only in ankle depth(-0.4cm) than the Korean women.

Among 15 circumference measurements, 7 ones-excluding such circumferences as head, under chest, waist, hip, arm scye, elbow, knee and ankle-were different significantly between two groups. Chinese women had larger circumferences of upper chest(+2.1cm), chest(+1.7cm), abdomen(+1.7cm), upper arm(+1.5cm) and thigh(+1.2cm).

Meanwhile, the Chinese college women had larger shoulder angles, both left(1.2°) and right(1.8°), than their Korean counterparts, which suggests that the Chinese women's shoulders are more drooped.

There was almost little difference of weight between two groups, but their Roher indices differed due to difference of stature. Namely, Chinese women' obesity was a little higher(0.1) than Korean women'.

The rates of flatness resulted from comparing three primary circumferences-namely, chest, waist and hip-are shown in (Table 2). There was some significant difference in chest and waist circumferences; Chinese women had higher rates of flatness than Korean women in chest(0.03) and waist circumference (0.06), while both groups had similar rate of flatness in hip circumference.

<Table 2> Comparison of flatness rates

| Item | Chinese | | Korean | | t-value |
|---------------------|---------|------|--------|------|---------|
| | Mean | S.D | Mean | S.D | |
| Chest circumference | 0.83 | 0.05 | 0.80 | 0.05 | -4.2*** |
| Waist circumference | 0.76 | 0.05 | 0.70 | 0.04 | -7.9*** |
| Hip circumference | 0.64 | 0.04 | 0.64 | 0.03 | -0.3 |

* $p < .05$, ** $p < .01$, *** $p < .001$

Such results suggest that Korean women have flatter chest and waist.

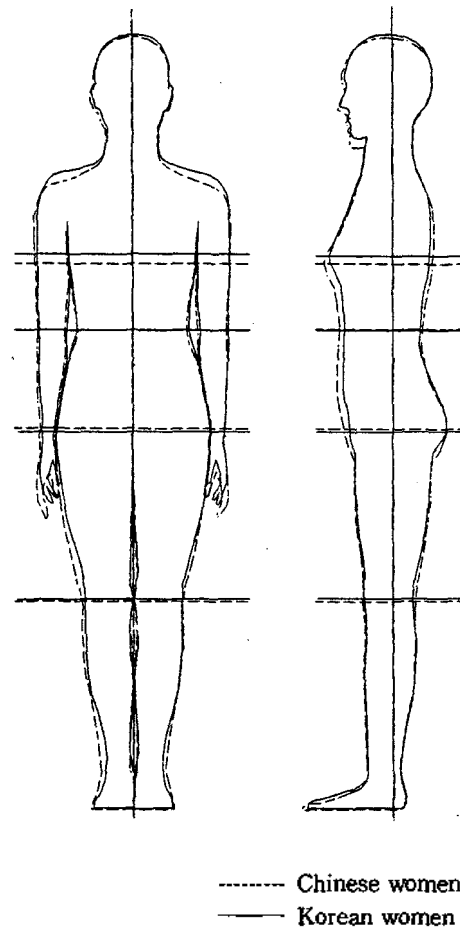
All in all, the Chinese college women are shorter than the Korean college women but are as much heavy as the latter group. In other words, the Chinese women are obeser with shorter arms and upper body part. Moreover, their constitutional depths are larger compared with their constitutional breadths, which means higher rates of flatness for chest and waist. Namely, they have deeper and more voluminous chest. On the other hand, Chinese women's shoulders are drooped more than Korean women', although two groups' shoulder measurements are similar.

2. Matching between Constitution and Silhouette

The silhouette matching sketches drawn using the average measurements of Chinese and Korean college women' body are shown in (Fig. 1). As shown in the front silhouette, Chinese women' chest circumference line was located lower than Korean women' when both lines were positioned at the same height. This means that Chinese women' chest may look more drooped. Also, because Chinese women' shoulder slope is larger, their shoulders may look more drooped.

As shown in the side silhouette matching sketches, Chinese women have larger and more voluminous chest, while their body is deeper in overall terms. Furthermore, their legs are longer compared with their stature.

Besides, as Chinese women have the nipples located lower compared with their up-



<Fig. 1> Matching between constitution and silhouette.

per body length, their vertical breast line is longer with their shoulders drooped much. Any way, Chinese women have more volumin-

ous breasts combined with deeper body and longer legs.

3. Factors of the Constitution

In order to determine the factors of the body type for two groups, 72 body measurements were analyzed, and in consideration of a screen-test result and factor interpretation, 8 factors were determined as comprising the body type. The accumulative contribution rate of these 8 factors to the body type was 68.9%. Effect, unique value and variance of each factor which were calculated with Varimax revolution are shown in <Table 3>.

Factor 1 may be an 'obesity factor' reflecting most breadths, depths, circumferences and weight. The measurements which are reflected most by this factor is chest circumference (.91), followed by waist circumference(.88), upper chest circumference(.87), weight(.87), under chest circumference(.86), upper arm circumference(.86) and hip circumference(.85) in order. Inversely, these measurements which may represent the obesity of the body is most influential among 8 factors. The higher the score of this factor is, the obeses the person is. Its eigenvalue is 23.0, while it explains about 31.5% of the entire variances.

Factor 2 reflects most height measurements including neck height posterior(.96), stature (.96) and neck height side(.95) as well as such lengths as arm(.82) and elbow(.76). The waist back length is reflected more or less(.53) by this factor. After all, this factor may represent 'the vertical size of the body'. The higher its score is, the larger vertical size of body is with the arms longer. Its eigenvalue is 11.7. This factor explains about 16.1% of the entire variances with 47.6% of its accumulative contribution rate.

Factor 3 reflects ankle depth(.66) and ankle breadth(.63) relatively highly, while affecting more or less knee depth(.57), head breadth(.53) and head depth(.44). In short, this factor may well represent the sizes of

'ankles, knees and head'. Its eigenvalue is 4.3. This factor explains about 5.9% of the entire variances with 53.5% of its accumulative contribution rate.

Factor 4 reflects waist front length(.88) and neck side-nipple-waist line(.77) relatively highly, and thus, may well represent 'the front length of upper body'. Its eigenvalue is 2.7. This factor explains about 3.8% of the entire variances with 57.3% of its accumulative contribution rate.

Factor 5 reflects should-to-shoulder length (.83), shoulder breadth(.81) and shoulder length, and therefore, may well represent 'the sizes of shoulders'. Its eigenvalue is 2.6. This factor explains about 3.6% of the entire variances with 60.9% of its accumulative contribution rate.

Factor 6 reflects nipple-to-nipple breadth(.82) most, while affecting more or less neck root circumference(.51), arm scye depth(.49) and neck root breadth(.47). But it affects the upper chest breadth negatively(-.79). In short, this factor may well represent 'the forms and sizes of neck and upper chest'. Its eigenvalue is 2.1. This factor explains about 3.0% of the entire variances with 63.9% of its accumulative contribution rate.

Factor 7 reflects shoulders' inclination highly, and thus, may well represent 'the inclination of the shoulders'. Its eigenvalue is 1.9. This factor explains about 2.6% of the entire variances with 66.5% of its accumulative contribution rate.

Factor 8 reflects waist side-hip line length(.61), crotch length(.54) and hip length(.51). In short, this factor may well determine 'the size of hip'. Its eigenvalue is 1.7. This factor explains about 2.4% of the entire variances with 68.9% of its accumulative contribution rate.

4. Comparison of Body Type Factors

The results of a comparative review of Chinese and Korean women' body type factors are shown in <Table 4>.

<Table 3> Factor analysis results

| Item | Factor | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 | Factor 6 | Factor 7 | Factor 8 | Communality |
|----------------------------|--------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|
| Chest circumference | .91* | -.02 | -.01 | .12 | .08 | .03 | -.13 | -.06 | .86 | |
| Waist circumference | .88* | .01 | -.02 | -.04 | .11 | .11 | -.11 | -.02 | .82 | |
| Upper chest circumference | .87* | .05 | .00 | .17 | .24 | .00 | -.04 | -.06 | .85 | |
| Weight | .87* | .33 | .03 | .04 | .15 | .06 | -.02 | .20 | .92 | |
| Under chest circumference | .86* | .08 | -.02 | .07 | .12 | -.02 | -.17 | .00 | .79 | |
| Upper arm circumference | .86* | -.10 | -.12 | .10 | .12 | -.03 | .09 | .09 | .80 | |
| Hip circumference | .85* | .14 | .10 | .03 | .10 | .07 | .07 | .27 | .85 | |
| Thigh circumference | .83* | .04 | .03 | .02 | .09 | .05 | .11 | .25 | .78 | |
| Abdomen depth | .83* | -.09 | .10 | .09 | .10 | -.01 | .08 | -.02 | .73 | |
| Waist depth | .82* | -.02 | .14 | .01 | .05 | .01 | .04 | -.02 | .69 | |
| Chest depth | .82* | -.05 | .09 | .19 | -.12 | .02 | -.02 | -.15 | .75 | |
| Abdomen circumference | .81* | .00 | .07 | -.01 | .11 | -.01 | -.08 | -.12 | .68 | |
| Elbow circumference | .81* | .10 | .06 | .11 | .13 | .00 | -.03 | .15 | .71 | |
| Under chest circumference | .76* | -.05 | .09 | .21 | -.12 | -.13 | .18 | -.18 | .73 | |
| Abdomen breadth | .75* | .16 | .28 | .01 | .13 | -.12 | .00 | -.10 | .71 | |
| Hip depth | .74* | .08 | .28 | -.01 | .05 | .00 | .10 | .19 | .68 | |
| Chest breadth | .72* | .11 | .23 | .02 | .24 | .03 | -.31 | -.12 | .75 | |
| Knee circumference | .71* | .15 | .19 | .13 | -.05 | .19 | .08 | .18 | .65 | |
| Upper chest depth | .70* | .03 | .22 | .24 | -.11 | -.06 | .20 | -.20 | .69 | |
| Thigh depth | .69* | .02 | .33 | -.09 | .07 | -.02 | .10 | .27 | .68 | |
| Wrist circumference | .67* | .08 | -.02 | .24 | .14 | .04 | .03 | .19 | .57 | |
| Armhole circumference | .67* | .26 | -.09 | .05 | -.05 | .25 | -.17 | .05 | .62 | |
| Hip breadth | .67* | .23 | .33 | .05 | .12 | .02 | .07 | .08 | .63 | |
| Thigh breadth | .64* | .12 | .40 | -.19 | .03 | .11 | -.01 | .20 | .66 | |
| Maximum body breadth | .62* | .05 | .19 | .13 | .29 | .08 | .04 | -.02 | .53 | |
| Waist breadth | .62* | .18 | .30 | -.24 | .18 | .20 | -.32 | -.01 | .73 | |
| Under chest breadth | .61* | .19 | .31 | -.10 | .29 | .08 | -.34 | -.04 | .72 | |
| Neck side to nipple length | .56* | .09 | -.14 | .06 | .03 | .11 | -.12 | -.02 | .37 | |
| Knee breadth | .55* | .02 | .53* | .13 | -.07 | .13 | .22 | .03 | .66 | |
| Ankle circumference | .54* | .06 | .02 | .16 | .04 | .08 | .31 | .24 | .48 | |
| Arm scye depth | .51* | -.01 | .41 | .10 | -.01 | -.26 | .02 | .06 | .50 | |
| Back interscye length | .50* | .07 | -.06 | -.06 | .48 | -.04 | .16 | -.03 | .52 | |
| Front interscye length | .46 | -.01 | -.13 | .37 | .41 | .02 | .05 | -.05 | .54 | |
| Neck root depth | .46 | .02 | .25 | .08 | .12 | .28 | .00 | .00 | .36 | |
| Head circumference | .40 | .13 | .03 | -.12 | .27 | .17 | .13 | -.13 | .32 | |
| Neck height posterior | .09 | .96* | .00 | .10 | .12 | .06 | .00 | .10 | .96 | |
| Stature | .06 | .96* | .03 | .10 | .11 | .07 | .01 | .12 | .96 | |
| Acromion height | .07 | .95* | .04 | .09 | .01 | .10 | -.12 | .12 | .95 | |
| Neck height side | .10 | .95* | .01 | .09 | .08 | .09 | .00 | .12 | .94 | |
| Neck height anterior | .10 | .95* | .04 | .17 | .06 | .02 | .05 | .13 | .96 | |
| Nipple height | -.02 | .94* | .07 | .12 | .03 | .02 | -.02 | .11 | .92 | |
| Gnation height | .05 | .94* | .02 | .10 | .12 | .10 | -.02 | .13 | .93 | |
| Waist height | .13 | .93* | .02 | -.04 | .06 | -.02 | .10 | .07 | .89 | |
| Perineum height | .06 | .89* | .02 | -.16 | -.01 | -.07 | .04 | -.13 | .84 | |
| Hip height | .16 | .86* | -.03 | .10 | .05 | .02 | .16 | -.19 | .84 | |
| Arm length | .09 | .82* | -.01 | -.25 | .05 | -.04 | -.09 | -.07 | .76 | |
| Wrist height | -.03 | .78* | .11 | .15 | -.02 | .13 | -.27 | .30 | .82 | |
| Elbow length | .15 | .76* | .02 | -.19 | -.02 | -.08 | -.05 | -.07 | .65 | |
| Tibial medial height | .05 | .73* | .07 | .07 | -.09 | .04 | .03 | -.11 | .57 | |
| Fingertip height | -.14 | .57* | .15 | .07 | -.05 | .02 | -.25 | .24 | .50 | |
| Waist back length | .04 | .53* | -.03 | .26 | .20 | .26 | -.19 | .17 | .51 | |
| Ankle height | .09 | .43 | .17 | -.19 | -.12 | -.19 | -.24 | .11 | .37 | |

<Table 3> Continued

| Item | Factor | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 | Factor 6 | Factor 7 | Factor 8 | Communality |
|-----------------------------------|--------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|
| Ankle depth | | .25 | .20 | .66* | -.05 | -.07 | .21 | -.04 | .20 | .63 |
| Ankle breadth | | .12 | .03 | .63* | -.20 | -.03 | .21 | -.23 | .23 | .60 |
| Knee depth | | .41 | .17 | .57* | .26 | -.01 | .06 | .16 | -.09 | .63 |
| Head breadth | | .17 | .03 | .53* | -.03 | .04 | .01 | .37 | -.11 | .46 |
| Head depth | | -.02 | -.01 | .44 | .06 | .00 | .05 | -.08 | -.34 | .31 |
| Waist front length | | .23 | .08 | .03 | .88* | .08 | -.10 | .05 | -.01 | .84 |
| Neck side-nipple-waistline length | | .41 | .23 | .00 | .77* | .06 | .04 | -.09 | .04 | .83 |
| Shoulder to shoulder length | | .29 | .12 | -.07 | .06 | .83* | .00 | .19 | .06 | .82 |
| Shoulder breadth | | .30 | .15 | .16 | .10 | .81* | -.07 | .09 | .12 | .82 |
| Shoulder length | | .11 | .00 | -.07 | .11 | .60* | -.23 | .06 | .22 | .48 |
| Nipple to nipple breadth | | .19 | .05 | .21 | -.11 | -.17 | .82* | -.16 | -.06 | .82 |
| Neck root circumference | | .38 | .23 | .24 | -.09 | .30 | .51* | -.13 | -.15 | .65 |
| Arm scye length | | .41 | .15 | .01 | .06 | -.01 | .49 | .25 | -.01 | .50 |
| Neck root breadth | | .21 | .04 | .38 | .11 | .37 | .47 | .12 | -.19 | .61 |
| Upper chest breadth | | .20 | -.01 | -.09 | .15 | .35 | -.79* | .01 | .07 | .82 |
| Shoulder right angle | | -.01 | -.08 | .05 | -.05 | .12 | -.04 | .74* | -.02 | .58 |
| Shoulder left angle | | -.06 | -.11 | .02 | .08 | .20 | -.01 | .61* | .09 | .44 |
| Waist side-hip line length | | .07 | .22 | .07 | -.05 | .12 | -.16 | -.04 | .61* | .48 |
| Crotch length | | .47 | .35 | -.02 | -.13 | .08 | .14 | -.04 | .54* | .67 |
| Gluteal length | | .11 | .34 | .00 | .16 | .17 | -.14 | .15 | .51* | .48 |
| Eigenvalues | | 23.0 | 11.7 | 4.3 | 2.7 | 2.6 | 2.1 | 1.9 | 1.7 | |
| Proportion(%) | | 31.5 | 16.1 | 5.9 | 3.8 | 3.6 | 3.0 | 2.6 | 2.4 | |
| Cumulative(%) | | 31.5 | 47.6 | 53.5 | 57.3 | 60.9 | 63.9 | 66.5 | 68.9 | |

* means a factor load of 0.5 or more

<Table 4> Factor scores and t-test results

| Factors | Characteristics | Factor score | | Chinese | | Korean | | t-Value |
|----------|---|--------------|------|---------|------|----------|-----|---------|
| | | Mean | S.D | Mean | S.D | Mean | S.D | |
| Factor 1 | The body obesity | 0.20 | 0.10 | -0.20 | 0.96 | -2.84** | | |
| Factor 2 | The vertical size of the body | -0.27 | 0.96 | 0.27 | 0.96 | 4.08*** | | |
| Factor 3 | The size of ankle, knee and head | -0.13 | 1.33 | 0.13 | 0.45 | 1.96 | | |
| Factor 4 | The front upper body length | -0.45 | 0.94 | 0.45 | 0.84 | -7.05*** | | |
| Factor 5 | The shape and size of shoulder | 0.01 | 1.08 | -0.01 | 0.92 | -0.20 | | |
| Factor 6 | The form and size of neck and upper chest | -0.26 | 1.31 | 0.26 | 0.39 | 3.81*** | | |
| Factor 7 | The drooping of shoulders | -0.48 | 0.81 | 0.48 | 0.94 | -7.75*** | | |
| Factor 8 | The shape and size of hip | 0.15 | 1.00 | -0.15 | 0.97 | 2.27* | | |

* p<.05, ** p<.01, *** p<.001

Since there were found significant differences of all the factors but factor3 and 5 be-

tween two groups, it may well be concluded that Chinese and Korean women have differ-

ent body type factors. To be more specific, Chinese women are obeser than Korean women, while their vertical body size is smaller with their larger upper front body length. In addition, Chinese women's shoulders are more drooped, and their hips are larger than Korean women's. But there were found no significant differences of ankle, knee, head and shoulder sizes between two groups.

IV. Conclusion and Suggestions

As described before, this study aimed to provide for the basic data useful to Korean apparel exporters who want to develop appropriate apparel sizes for Chinese woman consumers. To this end, 200 Chinese and Korean college female students' body measurements were surveyed, and thereupon their constitutional factors were reviewed comparatively to be determined. This study can be concluded as follow together its suggestions.

1. As a result of comparing Chinese and Korean women's body measurements, it was found that Chinese women are shorter and obeser than Korean women. Besides, their arms and upper body are shorter, and their body is thicker compared with their relatively narrower breadths. In other words, their body volume is deeper than Korean women who have relatively flat chest. After all, Chinese women's chests are more voluminous, while their shoulders are drooped more, although their shoulder size is almost as same as Korean women's.
2. As a result of comparing the body silhouettes between two groups, it was found that Chinese women's nipples are located comparatively lower against their shorter upper body length. Thus, their breast line is longer with their shoulders drooped much. Thus, their breasts are larger and more voluminous with their deeper body. In all, their body silhouette

looks longer with their longer legs.

3. As a result of analyzing 72 measurements to determine the body type factors for both groups, it was found that both college female students's body types are affected much by 8 factors such as body obesity, vertical body size, ankle and knee sizes, head size, front upper body length, shoulder size, form and size of neck and upper chest, drooping of shoulders and size of hip. The accumulative contribution rate of these factors was 68.9%.
4. As a result of t-test, the factor scores resulted from the above factor analysis, it was found that Chinese female students are obeser with larger vertical body length and front upper body length. And their shoulders are more drooped with larger hip. But two nations' female students did not show any differences in the sizes of ankles, knees, head and shoulders.

As discussed above, Chinese and Korean college female students have different body types. Therefore, Korean apparel exporters are requested to take into due consideration such differences, for example, the differences in front, back, upper and lower, or distribution of darts, in their development of prototype apparels.

Lastly, since this study has comparatively reviewed the simple body measurements between Chinese and Korean women, it is hoped that future studies would examine and classify the body types using some body type indices and furthermore, would survey the distribution of the body measurements to determine the specifications of apparel as well as their patterns.

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