

A Study on Comparison of Upper Body Shapes and Types of Chinese Adult Women in Beijing and Shanghai⁺

– Focused on a Time-Series Analysis
by Region and between Regions –

Sohn, Hee-Soon · Chang, Hee-Kyung*

Prof., Dept. of Clothing & Textiles, Sookmyung Women's University
Ph D. course, Dept. of Clothing & Textiles, Sookmyung Women's University*

Abstract

This study was aimed at providing some information about Chinese adult women's body measurements and standard body types to the Korean apparel businesses who have advanced into the Chinese apparel markets, while endeavoring to localize their businesses, and thereby, conducing to development and production of women's apparel well fitting the Chinese consumers in terms of measurements and shapes. To this end, the researchers sampled the Chinese adult women in Beijing and Shanghai aged between 19 and 20 and therewith, surveyed their upper body measurements and changes over time and thereupon, determined their standard body types.

Key Words : body measurements, comparison of body types, body shape

I . Introduction

1. Purpose of Study

On the threshold of the information society in the 21st century, the world economy is being integrated into a unitary market. While the barriers of trade, investment and capital transfers are being collapsed, the fashion enterprises attempt to take comparative advantages and maximize their profits by transcending the national

borders to advance into every corner of the world for a global management of their businesses. In such circumstances, the Korean fashion enterprises face a great challenge of designing and implementing innovative global management strategies and policies in order to respond positively to such a changing international business environment and sustain their growth.¹⁾

In particular, China is a huge market expected to lead the world economy in the 21st century. In 2005, per capita disposable income in major

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Corresponding author: Chang, Hee-Kyung, Tel.+82-2-710-9461 Fax.+82-2-710-9479
E-mail: chang0247@hanmail.net

Chinese cities increased 9.6% in real terms from the previous year, while their apparel markets recorded a stable growth. Not only sales of apparel increased, but also the price indices of apparel rose, attracting much attention from the Korean fashion industry. In case of large outlets, the sales of apparel increased 25.0% from the previous year, which was higher than the average increase of the total commodity sales (7.4%). The sales of apparel in terms of quantity increased 21.4%. As the Chinese apparel markets are being more and more globalized, it is expected that the women's apparel makers would face a more fierce competition, not so much in terms of price as in terms of the total competition covering styles, vogue, sales environment, etc.²⁾

The Korean apparel makers who have advanced into the Chinese markets since establishment of the diplomatic relation between Korea and China in 1992 move to find a breakthrough in China for their business, as recession of Korean domestic women's apparel markets is prolonged. Nevertheless, they cannot afford to take time to examine Chinese adult women's body shapes and types due to their short-term business strategies and lack of a longer perspective, compared with the world-class apparel enterprises.

Because of the wide geographical and racial variances, the body shapes are much differentiated in China. Although the Korean apparel enterprises are fully aware of the problems involving Chinese women's apparel fitting in association with their apparel silhouettes and wearing, they do not seem to reflect them appropriately in their design and production of apparels, while not collecting the objective information properly. Until some time ago, the Korean apparel enterprises had distributed in China the commodities planned in Korea, but many of them are now localizing their

apparel planning and production in China, which requires them to collect the data about Chinese adult women's body shapes and types. On the other hand, preceding studies reported that Chinese adult women's body shapes and types were very different by age groups and regions³⁾⁴⁾. Based on such findings, it is deemed necessary to research into Chinese adult women's body shapes and their standard body types to help the Korean women's apparel makers doing business in China to develop and produce the apparels befitting the Chinese adult women's body shapes and types.

The purpose of this study is to research into Chinese adult women's upper body measurements and thereby, provide for some basic data useful to the apparels production for Chinese adult women. For this purpose, the researchers conducted a time-series analysis for the data collected by us about the body measurements in order to examine the changes of the body measurements of Chinese women in Beijing and Shanghai in their 20's between 1998 and 2004.

It must be almost impossible to determine the standard body shapes and measurements of Chinese women throughout the huge continent of China. Accordingly, this study is limited geographically to the capital of China or Beijing and her city of economy and trade or Shanghai and demographically to those Chinese women in their 20's or at the stage of physical maturity.

Since 1998, the researchers have continued to measure Chinese women's body sizes and thereby, provided the resultant data to the Korean apparel makers targeting the Chinese women consumers. Since the apparel planning and production are being localized in China, it is deemed more important than ever before to provide such information to the Korean apparel makers doing business in China.

2. Objectives of Study

This study aimed to compare the upper body shapes and types of the Chinese adult women in their 20's (aged between 19 and 29) in Beijing and Shanghai analysis their standard body types. The research examined the body shape and type trends by year and region based on the data collected through the survey conducted in the years of 1998, 1999, 2002 and 2004.

1. The researchers reviewed the trends of changing upper body measurements and shapes over time in the same regions by comparing the yearly upper body measurement data between Beijing and Shanghai adult women and examined the differences between two regions over years. Furthermore, the researchers compared the overall body measures between Beijing and Shanghai to comparatively analyze the differences of upper body measures and shapes between two regions.

2. The researchers comparatively analyzed the distributions of Chinese adult women's apparel sizes by means of correlation distribution analysis of entire group's statures and body types (Y, A, B and C types depending on drop measurements between chest and waist circumferences), and determined the standard body types by analyzing differences of apparel sizes between two regions through correlational distribution analysis of statures and body types.

II. Methods

1. Subjects and Data Collection

Random sampling method and Martin measurement method were used for this study to sample the subjects of study in their 20s in

Beijing and Shanghai and thereby, collect the data about their upper body measurements.

The items of measurement to determine Chinese adult women's upper body shapes were 43 in total: 8 about heights, 8 about breadths, 7 about depths, 7 about circumferences, 10 about lengths, 2 about angles, and 1 about weight. For this study, the researchers referred to the data previously collected about Korean adult women's body measurements⁵⁾⁶⁾.

For measurement of body forms, Martin type meter and scale were used. The measuring method was designed according to R. Martin's (1942) human body measurement method and in reference to "People's Standard Body Form Survey Report, 1997"⁷⁾. For the reference points and lines, were used KS A 7003 (Human Body Measurement Terminology) and KS A 7004 (Human Body Measurement Method)⁸⁾.

2. Statistical Analysis

The body measurements collected for this study were statistically processed using the SPSS/WIN 12.0. In order to determine the yearly body measurements and shapes of the Chinese adult women in Beijing and Shanghai, the data were subject to the time-series analysis for means, SDs, T-test, F-test and ex post facto Duncan-test. In order to determine the standard body types, the research compared the subject women's statures and body types variables (Y, A, B and C types) by means of correlation analysis and the resultant distribution of the correlation coefficient.

III. Results and Discussions

1. Analysis of Body measurements

1) Comparison of body measurements by years and regions

The 43 items of body measurements consisted of 8 about heights, 8 about breadths, 7 about depths, 7 about circumferences, 10 about lengths, 1 about weight, 2 about angles and other measurements (2 about drop measurements, 3 about body flatness ratio and 1 about Rohrer index). The results of the F-test for differences of measurements between regions and over years are as follows.

(1) Body measurements in Beijing

As a result of classifying the body measurement data about Chinese adult women in Beijing area over years and conducting the F-test for the differences of body measurements over years, significant but minimal differences were found in 36 items among the total 43 items. <See Table 1>.

Significant differences were found in only 2 items among 8 height items. Statures were not significantly different over time, but bust height differed most in 2002 and 2004, while abdomen height changed most in 2002. Usually, the vertical measurements were largest in 2002 and smallest in 1999.

In view of breadth, depth and body flatness ratio indicating obesity of the upper body, significant differences were found in 8 items over time. Neck breadth, biacromial breadth and hip width were largest in 1999, while the other breadths were largest in 2004.

The depths were all different in the total 7 items over time. Chest depth, abdomen depth and hip depth were largest in 1999, while the other depths were largest in 2004. Usually, breadth and depth measurements were largest in 2004 in Beijing area.

The items of body flatness ratio were all different significantly over time. The chest flatness ratio was largest in 2002, which means that Beijing adult women's chest protruded most in 2002. The waist flatness ratio was largest in 2004; the Beijing women had more flat body shape in 1999 and 2002. The hip flatness ratio was largest in 1999, which implies that Beijing women's hip protruded most that year.

Only 3 items differed over time in circumferences. Bust circumference and abdomen circumference were largest in 2004, while underbust circumference was largest in 2002. In 2004, breadths and depths of chest and abdomen parts were largest, which means that Beijing adult women had larger chests and abdomens in 2004.

The drop measurements were different over time. The drop between bust and waist circumferences was widest in 2004, but narrow between 2002 and 1999. The drop between hip and waist circumference was widest in 1999, but narrow in 2002 and 2004. Namely, the waist circumference changed less than bust or hip circumference over time, which means that Beijing adult women's waists looked more slender as time went on.

On the other hand, 9 items of length differed over time, and the differences were significant in 2 years. Waist front length, neck point to breast point to waist line, interscye front length, back length, etc., were largest in 1999, while all items but horizontal inter-bust point length were smallest in 2004. In 1999, Beijing adult women's waist front length was largest and their back length was smallest, and in 2004, their waist front and back lengths were both smallest. Their shoulder size did not differ over time, but their

<Table 1> Results of Comparing the Body Measurements in Beijing Area over Years (cm)

Div.	Measuring Items	Total(N=506)		Beijing						F-test	Duncan test
		M	SD	1999 (N=101)		2002 (N=138)		2004 (N=267)			
				M	SD	M	SD	M	SD		
HEIGHT	stature	158.79	5.50	158.37	5.32	158.86	5.07	158.91	5.78	0.37	
	menton height	136.29	5.21	135.58	5.11	136.69	4.90	136.35	5.39	1.38	
	anterior neck height	129.77	5.15	129.29	4.76	130.15	4.50	129.77	5.59	0.82	
	bust height	113.73	5.05	112.61	4.67	114.15	4.95	113.93	5.19	3.21*	b a a
	underbust height	108.05	5.24	.	.	107.76	5.03	108.19	5.34	0.61	
	waist height	98.93	4.42	98.68	4.24	98.68	4.30	99.16	4.56	0.73	
	abdomen height	89.08	4.19	.	.	90.02	4.28	88.60	4.06	10.59***	a b
	hip height	78.58	4.67	78.66	3.90	79.01	3.93	78.34	5.25	0.95	
BREADTH	neck breadth	12.13	1.06	12.32	0.70	11.85	1.06	12.21	1.14	7.59***	a b a
	biacrominal breadth	33.65	1.65	34.22	1.39	33.85	1.82	33.33	1.57	12.81***	a a b
	chest breadth	26.96	2.02	26.22	1.82	26.33	1.86	27.57	1.98	28.31***	b b a
	bust breadth	25.89	1.87	25.78	1.42	25.18	2.01	26.30	1.83	17.59***	b c a
	underbust breadth	24.54	1.78	24.16	1.20	23.85	1.99	25.04	1.69	25.48***	b b a
	waist breadth	22.60	2.14	22.24	1.39	22.07	2.09	23.00	2.32	10.71***	b b a
	abdomen breadth	29.43	2.38	29.36	1.92	27.98	2.28	30.20	2.23	47.12***	b c a
	hip breadth	32.07	2.02	32.25	1.44	31.19	1.89	32.44	2.14	19.33***	a b a
DEPTH	neck base depth	10.45	0.96	10.73	0.70	10.24	1.07	.	.	16.07***	
	chest depth	18.20	1.69	19.04	1.51	17.46	1.78	18.26	1.55	28.49***	a c b
	bust depth	21.75	2.12	21.57	1.72	21.44	2.11	21.98	2.24	3.44*	ab b a
	underbust depth	18.89	2.21	18.61	1.60	17.87	2.15	19.52	2.23	29.38***	b c a
	waist depth	17.39	2.20	16.93	1.46	16.80	2.24	17.87	2.31	14.19***	b b a
	abdomen depth	19.76	2.51	19.98	1.77	18.27	2.33	20.44	2.51	40.17***	a b a
	hip depth	20.18	2.05	20.92	1.51	19.02	1.65	20.50	2.17	36.40***	a b a
CIRCUMFERENCE	neck base circumference	37.42	1.99	37.63	2.03	37.66	2.31	37.22	1.77	2.86	
	chest circumference	83.48	5.14	83.57	4.08	83.19	5.29	83.60	5.42	0.31	
	bust circumference	84.72	5.97	83.76	4.66	83.92	5.91	85.50	6.34	4.91*	b b a
	underbust circumference	74.56	5.56	72.71	4.41	76.09	5.43	74.47	5.81	11.25***	c a b
	waist circumference	67.32	6.26	67.23	4.53	67.22	6.14	67.40	6.87	0.05	
	abdomen circumference	81.01	7.29	80.35	6.52	78.50	7.82	82.55	6.89	15.44***	b c a
	hip circumference	90.96	5.24	91.71	4.39	90.88	5.05	90.73	5.61	1.33	
LENGTH	waist front length	33.12	1.96	33.36	1.62	33.75	1.89	32.70	2.02	14.75***	a a b
	neck shoulder point to breast point	25.43	1.82	25.14	2.02	26.11	1.60	25.32	1.75	8.11***	b a b
	neck point to breast point to waistline	40.44	2.07	41.12	1.72	40.90	2.00	39.94	2.11	17.65***	a a b
	interscye, front	32.35	2.16	33.01	1.66	33.53	2.16	31.48	1.93	58.31***	b a c
	bust point-bust point	16.86	1.73	17.32	1.26	15.57	1.55	17.35	1.63	65.92***	a b a
	lateral shoulder to upperarm level length	17.71	1.48	17.38	1.13	17.95	1.66	.	.	9.18***	
	shoulder length	12.38	0.95	12.47	0.80	12.53	0.87	12.30	1.02	2.36	
	bilateral shoulder length	38.80	2.70	38.27	3.06	39.61	2.85	38.57	2.38	9.43***	b a b
	interscye, back	34.65	2.64	35.62	2.50	34.40	2.24	34.42	2.80	8.70***	a b b
	waist back length	37.67	1.78	37.30	1.40	38.18	1.88	37.54	1.79	8.88***	b a b
	ANGLE	right shoulder slope	23.13	3.80	24.01	3.96	22.17	3.69	23.28	3.70	7.49***	a b a
left shoulder slope		22.72	3.82	22.91	3.64	22.33	4.27	22.86	3.64	1.03	
DROP	bust-waist circumference	17.41	3.39	16.53	3.12	16.70	2.94	18.10	3.57	12.46***	b b a
	hip-waist circumference	23.65	3.91	24.48	3.47	23.66	3.28	23.33	4.30	3.24*	a ab b
FLATNESS	bust flatness	0.84	0.06	0.84	0.05	0.85	0.06	0.84	0.06	3.98*	b a b
	waist flatness	0.77	0.07	0.84	0.05	0.85	0.06	0.84	0.06	3.65*	b b a
	hip flatness	0.63	0.05	0.65	0.04	0.61	0.04	0.63	0.06	18.08***	a c b
OTHERS	weight(kg)	52.96	7.31	52.27	6.07	52.51	7.20	53.46	7.77	1.33	
	Rohrer index	1.32	0.18	1.32	0.16	1.31	0.18	1.33	0.18	0.70	

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

upper body was less pulled back over time, which means that their body shape was changing to be rather upright.

Left shoulder slope did not differ over time, but right shoulder slope was larger over time. In short, Beijing adult women's right shoulder drooped more over time.

Weight and Rohrer index did not differ significantly over time. Not only weight but also the vertical measurement or stature did not differ over time. Namely, Rohrer index or reference of

obesity relative to stature did not differ significantly over time. In terms of obesity index, Beijing adult women in their 20's were found to maintain their normal body shape continuously.

(2) Body measurements in Shanghai

As a result of classifying the body measurement data about Chinese adult women in Shanghai area over years and conducting the F-test for the differences of body measurements over years, significant differences were found in 30 items. <See Table 2>.

<Table 2> Results of Comparing the Body Measurements in Shanghai Area over Years

(cm)

Div.	Measuring Items	total(N=505)		shanghai						F-test	Duncan test
		M	SD	1998# (N=192)		2002 (N=109)		2004 (N=204)			
				M	SD	M	SD	M	SD		
HEIGHT	stature	159.84	5.31	160.24	5.64	158.85	5.19	159.98	5.01	2.52	
	menton height	137.11	7.98	136.64	11.24	136.86	4.92	137.68	5.07	0.92	
	anterior neck height	130.74	4.65	.	.	130.26	4.46	131.00	4.73	1.77	
	bust height	114.05	4.87	113.58	5.03	113.98	4.77	114.53	4.50	2.01	
	underbust height	108.80	4.81	108.54	4.81	108.56	4.83	109.19	4.86	1.09	
	waist height	98.35	4.45	96.84	4.45	98.07	4.22	99.93	4.16	26.82***	c b a
	abdomen height	89.75	4.15	.	.	89.38	3.83	89.94	4.30	1.33	
	hip height	78.20	6.34	77.21	8.92	78.56	3.82	78.94	3.95	3.95*	b ab a
BREADTH	neck breadth	11.72	0.76	.	.	11.34	0.75	11.93	0.69	49.09***	b a
	biacrominal breadth	33.80	1.46	.	.	33.24	1.25	34.11	1.47	27.60***	b a
	chest breadth	27.48	1.88	.	.	26.83	1.67	27.83	1.89	21.85***	b a
	bust breadth	26.04	1.70	26.14	1.49	25.34	1.51	26.31	1.87	12.62***	a b a
	underbust breadth	24.65	1.52	.	.	24.10	1.42	24.95	1.49	23.72***	b a
	waist breadth	23.07	2.28	23.63	2.63	22.35	1.67	22.93	2.08	12.10***	a c b
	abdomen breadth	29.23	1.99	.	.	28.63	1.51	29.55	2.14	16.02***	b a
	hip breadth	31.79	2.21	32.03	2.82	30.89	1.52	32.05	1.70	12.12***	a b a
DEPTH	neck base depth	.	.	.	.	.	.	18.21	1.50		
	chest depth	18.41	1.55	.	.	18.81	1.57	18.19	1.50	11.75***	a b
	bust depth	21.39	2.10	20.78	1.90	21.51	1.88	21.90	2.24	15.32***	b a a
	underbust depth	18.73	1.84	.	.	17.93	1.88	19.15	1.67	34.46***	b a
	waist depth	17.45	1.99	17.72	2.01	16.47	1.81	17.72	1.92	18.02***	a b a
	abdomen depth	19.56	2.00	.	.	19.12	1.80	19.80	2.07	8.31***	b a
	hip depth	20.60	1.91	21.52	1.71	19.45	1.46	20.34	1.89	53.10***	a b c
CIRCUMFERENCE	neck base circumference	37.60	2.49	39.78	2.03	36.09	1.65	36.36	1.67	225.30***	a b b
	chest circumference	81.70	4.54	81.22	4.46	81.99	4.61	82.01	4.56	1.81	
	bust circumference	82.73	5.29	82.33	5.41	83.37	5.11	82.78	5.27	1.34	
	underbust circumference	72.73	4.95	72.42	4.82	73.31	5.05	72.70	5.02	1.14	
	waist circumference	66.54	5.42	66.73	5.89	66.50	5.23	66.38	5.07	0.21	
	abdomen circumference	81.78	5.76	81.81	5.84	81.62	5.39	81.84	5.91	0.06	
	hip circumference	89.30	4.47	89.11	4.49	89.92	4.06	89.16	4.66	1.31	

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

<Table 2> Continued

cm)

Div.	Measuring Items	total(N=505)		shanghai						F-test	Duncan test
		M	SD	1998# (N=192)		2002 (N=109)		2004 (N=204)			
				M	SD	M	SD	M	SD		
LENGTH	waist front length	33.58	2.00	34.13	1.95	34.47	1.67	32.59	1.79	51.61***	a a b
	neck shoulder point to breast point	25.25	1.74	.	.	25.57	1.59	25.08	1.79	5.79**	a b
	neck point to breast point to waistline	40.28	1.97	.	.	41.36	1.76	39.71	1.83	59.29***	a b
	interscye, front	32.51	1.87	32.26	1.81	33.54	1.86	32.19	1.73	23.14***	b a b
	bust point-bust point	16.52	1.93	17.72	1.56	14.30	0.99	16.59	1.57	190.32***	a c b
	lateral shoulder to upperarm level length	.	.	.	.	.	.	.	.
	shoulder length	12.78	0.97	12.89	0.99	12.92	0.81	12.60	1.00	6.03***	a a b
	bilateral shoulder length	38.53	2.06	37.88	2.01	38.44	1.96	39.19	1.97	21.47***	c b a
interscye, back	33.43	2.27	33.49	2.22	33.99	2.40	33.08	2.20	5.93***	b a b	
ANGLE	waist back length	37.33	1.84	37.03	1.96	38.45	1.65	37.03	1.58	28.08***	b a b
	right shoulder slope	22.30	4.13	24.65	3.50	21.06	3.60	20.74	3.93	63.09***	a b b
	left shoulder slope	21.39	3.79	.	.	22.56	4.01	20.76	3.51	16.86***	a b
DR OP	bust-waist circumference	16.19	3.22	15.60	3.61	16.86	3.01	16.39	2.84	6.10***	b a a
	hip-waist circumference	22.76	3.68	22.38	3.88	23.41	3.56	22.78	3.52	2.76	
FLAT NESS	bust flatness	0.82	0.07	0.79	0.05	0.85	0.06	0.83	0.08	29.34***	c a b
	waist flatness	0.76	0.06	0.75	0.05	0.74	0.06	0.77	0.07	18.64***	b b a
	hip flatness	0.65	0.05	0.67	0.04	0.63	0.04	0.64	0.05	32.91***	a b b
OTHERS	weight(kg)	51.66	6.34	52.14	6.48	51.39	5.90	51.36	6.42	0.87	
	Rohrer index	1.27	0.15	1.27	0.15	1.28	0.15	1.25	0.15	1.39	

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

The measurement data in 1998 were offered by Donghua (China) University.

Significant differences were found in only 2 items among 8 height items. Statures and hip height were largest in 2004, while being smallest in 1998. In Shanghai region, statures did not differ significantly over years, but Shanghai adult women tended to have larger waist and hip heights over time, which means that they had shorter upper body but longer lower body.

In view of breadth, depth and body flatness ratio indicating obesity of the upper body, significant differences were found in 8 items over time. Bust breadth, waist breadth and hip width were largest in 1998, while the other breadths were largest in 2004 and smallest in 2002.

The depths were all different in 6 items over time. Chest and waist depths were largest in

2004, while waist and hip depths were both largest in 1998.

The items of body flatness ratio were all different significantly over years. The chest flatness ratio was largest in 2002, which means that Shanghai adult women's chest protruded most in 2002. The waist flatness ratio was largest in 2004; the Shanghai women had more round body shape that year, and they had flatter body shape in 1999 and 2002. The hip flatness ratio was largest in 1998, which implies that Shanghai women' hip protruded most that year. Summing up, Shanghai adult women in their 20's developed their body depth more than body breadth, and therefore, their upper body changed to be more round over time.

Only the neck base circumference among

items of circumferences differed significantly over years. The neck base circumference was largest in 1998, and similar between 2002 and 2004. Namely, the neck base circumference reduced as much as 3.5cm or more from 1998 to 2002 or 2004, but such wide difference was deemed due to difference of the measurement reference points. Shanghai adult women showed little changes in circumferences over time. In case of drop measurements, the drop between bust and waist circumferences was only significant: it was widest in 2002 and 2004, while narrowest in 1998.

On the other hand, 9 items of length differed over time. Waist front length was largest in 1998 and 2002, while interscye front length, interscye back length and back length were largest in 2002, followed by 1998 and 2004 in their order.

Angles differed over years. Right shoulder slope was largest in 1998 and small in 2002 and 2004. Namely, Shanghai adult women's right shoulder drooped most in 1998.

Weight and Rohrer index did not differ significantly over time. Not only weight but also the vertical measurement or stature did not differ over time. Namely, Rohrer index or reference of obesity relative to stature did not differ significantly over time. Compared with Beijing adult women (1.32), Shanghai adult women had rather slender body shape in terms of Rohrer index.

2) Overall comparison of body measurements between regions

As a result of classifying the overall measurement data by region and year (1998, 1999, 2002 and 2004) and thereby summing up them for T-test, it was found that 33 items differed between two regions as shown in <Table 3>.

In case of heights, all items but mentum and hip heights differed significantly between two regions. Almost all measurements were larger in Shanghai than Beijing. Namely, the Beijing adults women in their 20's had smaller stature (-1.05cm), neck front height (-0.97cm), bust height (-0.97cm) and abdomen height (-0.67cm), which means that this group's vertical sizes were smaller in overall terms. As a whole, Shanghai adult women in their 20's had larger vertical body sizes than their Beijing counterparts except for waist height (+0.58cm). Especially, Shanghai adult women had higher bust position in terms of the front proportion.

In view of such items related to upper body obesity as breadth, depth and body flatness ratio, only 3 items of breadth differed between two groups. Beijing women had larger neck breadth (+0.41cm) but smaller bust breadth (-0.52cm) and waist breadth (-0.47cm) than their Shanghai counterparts. Since Beijing women had smaller chest and waist breadths compared with their hip and shoulder breadths, it was analyzed that they had more curved upper body shape. Such statistical differences of upper body measurements between Beijing and Shanghai adult women suggest difference of body shape between them, but the real differences were minimal enough to find no visible difference of silhouette between two groups.

In case of depths, there were found significant differences in neck base depth (0.44cm), bust depth (0.36cm) and hip depth (0.42cm) as well as body flatness ratio between two groups. Beijing women had larger chest and waist flatness ratios and smaller hip flatness ratio than their Shanghai counterparts, which suggests that Beijing women had thicker neck and deeper chest and waist compared with hip. Namely, Beijing

<Table 3> Comparison of Overall Measurement Data between Beijing and shanghai (cm)

Div.	Measuring Items	Beijing total (N=506)	shanghai total (N=505)	T-test
		M	M	
H E I G H T	stature	158.79	159.84	-3.08***
	menton height	136.29	137.11	-1.94
	anterior neck height	129.77	130.74	-2.71*
	bust height	113.73	114.05	-1.04
	underbust height	108.05	108.80	-2.27*
	waist height	98.93	98.35	2.07*
	abdomen height	89.08	89.75	-2.11*
	hip height	78.58	78.20	1.08
B R E A D T H	neck breadth	12.13	11.72	5.94***
	biacrominal breadth	33.65	33.80	-1.38
	chest breadth	26.96	27.48	-3.67***
	bust breadth	25.89	26.04	-1.29
	underbust breadth	24.54	24.65	-0.95
	waist breadth	22.60	23.07	-3.37***
	abdomen breadth	29.43	29.23	1.21
	hip breadth	32.07	31.79	2.04*
D E P T H	neck base depth	10.45	10.01	4.02***
	chest depth	18.20	18.41	-1.75
	bust depth	21.75	21.39	2.74*
	underbust depth	18.89	18.73	1.08
	waist depth	17.39	17.45	-0.46
	abdomen depth	19.76	19.56	1.16
	hip depth	20.18	20.60	-3.36***
	C I R C U M F E R E N C E	neck base circumference	37.42	37.60	-1.25
chest circumference		83.48	81.70	5.83***
bust circumference		84.72	82.73	5.60***
underbust circumference		74.56	72.73	5.54***
waist circumference		67.32	66.54	2.10*
abdomen circumference		81.01	81.78	-1.87
hip circumference		90.96	89.30	5.42***
L E N G T H		waist front length	33.12	33.58	-3.71***
	neck shoulder point to breast point	25.43	25.25	1.39
	neck point to breast point to waistline	40.44	40.28	1.07
	interscye, front	32.35	32.51	-1.31
	bust point-bust point	16.86	16.52	2.49***
	lateral shoulder to upperarm level length	17.71	18.36	-3.94***
	shoulder length	12.38	12.78	-6.33***
	bilateral shoulder length	38.80	38.53	1.75
	interscye, back	34.65	33.43	7.90***
	waist back length	37.67	37.33	2.94***
A N G L E	right shoulder slope	23.13	22.30	3.32***
	left shoulder slope	22.72	21.39	4.88***
D R O P	bust-waist circumference	17.41	16.19	5.83***
	hip-waist circumference	23.65	22.76	3.71***
F L A T N E S S	bust flatness	0.84	0.82	4.52***
	waist flatness	0.77	0.76	3.55***
	hip flatness	0.63	0.65	-5.33***
O T H E R S	weight(kg)	52.96	51.66	3.02***
	Rohrer index	1.32	1.27	5.63***

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

women had rather round body shape. On the other hand, Shanghai women had larger hip flatness ratio, which suggests that they had a body shape with deeper hip and abdomen below waist line. Consequently, Beijing adult women had deeper upper body than waist, while their Shanghai counterparts had deeper lower body than upper body.

In case of Rohrer items, differences were found in 4 items. Beijing adult women were found to have larger chest circumference (+1.78cm), bust circumference (+1.99cm), underbust circumference (+1.84cm) and hip circumference (+1.66cm). In overall terms, the differences of body circumferences were large; Beijing women had deeper upper body than their Shanghai counterparts.

Such findings may contradict the preceding findings that Shanghai women had larger upper body in terms of breadth and depth, which suggests that Beijing women had a little higher obesity index than Shanghai women, as proven by the finding that their upper body circumferences indicating the horizontal obesity was much larger as a whole.

In terms of drop measurements, the drop between bust and waist circumferences (1.22cm) and hip and waist circumferences (0.86cm) were larger in Beijing women. Beijing women developed chest circumference more than hip circumference in reference to the waist, and had larger chest and hip. In contrast, Shanghai women developed hip more. Thus, Beijing women had slender waist and larger chest than their Shanghai counterparts. Such findings agreed to the preceding analysis that Beijing women (1.32) were more obese than their Shanghai counterparts (1.27).

In case of length measurements, 6 items

among 9 ones differed significantly between two groups: waist front length (0.46cm), shoulder length (0.40cm), interscye back length (1.20cm), back length (0.30cm), etc. Shanghai women had longer waist front length, shorter back length and interscye back length, which suggests that they had their upper body pulled back more than their Shanghai counterparts.

Beijing women had larger right shoulder slope (0.83) and left shoulder slope (1.33), which means that their shoulders drooped more than their Shanghai counterparts.

Beijing women were heavier than Shanghai women, and their Rohrer index (1.32) was higher. Both groups had normal body shape in terms of obesity, but Shanghai women (1.27) were more slender.

2. Correlation analysis between Statures and Drop Values

In order to analyze the differences of upper body shapes between two Chinese adult women groups and determine their standard body types, the researchers referred to the methods presented by DPRC Standard (GB/T 1335.2-1997)¹⁰ and thereby, comparatively analyzed the correlation distribution of their statures and body shapes.

The Chinese apparel sizes are divided into 'sizes' and 'types'. The former means the statures 7 of which are set at the interval of 5cm from 145cm to 175cm. The types are subdivided into 4 depending on the drop between bust and waist circumferences (hereinafter referred to as 'drop measurements'): Y type (19cm-24cm of the drop measurement), A type (14cm-18cm of the drop measurement), B type (9cm-13cm of the drop measurement) and C type (4cm-8cm of the drop measurement).

1) Distribution of correlation coefficient between Statures and Drop Values in the Population Sampled

The results of analyzing the correlation distribution of statures (at the interval of 5cm) and drop measurements (criteria for classification of body shapes: Y, A, B and C) for the entire sample (n=1,016) of the Chinese adult women in their 20's, as suggested by GB, can be summarized as in <Table 4>.

The statures were distributed most at the interval of 160cm, accounting for 38.0% of the entire sample, followed by the interval of 155cm (27.0%) and 165cm (19.3%) in their order. In total, 84.27% of the entire sample were distributed at the three intervals (155–165cm).

On the other hand, A type emerged most, accounting for 54.9% of the entire sample, followed by Y type (29.6%) and B type (13.2%). Y type features smaller waist circumference than chest circumference, A type is a normal body type, and B type features larger waist circumference than chest circumference, which means that they are more fat or have smaller chest. C type is a very fat group¹¹⁾. In all, 84.5% (n=854) of the entire sample were distributed in A type or normal type and Y type

with smaller waist circumference.

In terms of size/type, 160A accounted for most (21.7%) of the sample, followed by 155A (14.9%), 160Y(10.4%), 165A(9.8%), 155Y(7.8%) and 165Y(6.3%) in their order. All in all, 70.92% (n=947) were concentrated at three intervals of 155–165cm and in the combination of A and Y types.

2) Regional distributions of correlation coefficient between Statures and Drop Values

The results of analyzing the correlation distribution of statures and body types (Y, A, B and C) for the entire sample by region are summed up in <Table 5>.

In both regions, most of the sample were distributed at the interval of 160cm (38.1% in Beijing and 37.8% in Shanghai), followed by the interval of 155cm (25.9% in Beijing and 28.1% in Shanghai) and 165cm (18.2% in Beijing and 20.4% in Shanghai) in their order. In overall terms, 82.21% of Beijing women and 86.34% of Shanghai women were concentrated at the three intervals (160, 155 and 165cm).

On the other hand, A types were distributed most in both regions (49.8% in Beijing and 60.0% in Shanghai), followed by Y type (36.8%

<Table 4> Distribution of the Correlation Distribution between Statures and Drop Values in the Population Sampled

body shapes (型) stature(号)	Y	A	B	C	4cm under	total
145cm	6(0.6%)	5(0.5%)	2(0.2%)	0(0.0%)	0(0.0%)	13(1.3%)
150cm	23(2.3%)	46(4.5%)	9(0.9%)	1(0.1%)	3(0.3%)	82(8.1%)
155cm	79(7.8%)	151(14.9%)	37(3.7%)	3(0.3%)	3(0.3%)	273(27.0%)
160cm	105(10.4%)	219(21.7%)	50(4.9%)	8(0.8%)	2(0.2%)	384(38.0%)
165cm	64(6.3%)	99(9.8%)	30(3.0%)	1(0.1%)	1(0.1%)	195(19.3%)
170cm	15(1.5%)	28(2.8%)	5(0.5%)	1(0.1%)	1(0.1%)	50(4.9%)
175cm	7(0.7%)	7(0.7%)	0(0.0%)	0(0.0%)	0(0.0%)	14(1.4%)
total	299(29.6%)	555(54.9%)	133(13.2%)	14(1.4%)	10(1.0%)	1011(100.0%)

The shaded part means 3.5% or more of distribution.

person (%)

<Table 5> Distribution of the Correlation Distribution between Statures and Body Types in Beijing and Shanghai

	body shapes (型) stature(号)	Y	A	B	C	4cm under	total
	B e i j i n g	145cm	6(1.2%)	4(0.8%)	1(0.2%)	0(0.0%)	0(0.0%)	11(2.2%)
150cm		18(3.6%)	27(5.3%)	5(1.0%)	1(0.2%)	3(0.6%)	54(10.7%)
155cm		43(8.5%)	71(14.0%)	15(3.0%)	0(0.0%)	2(0.4%)	131(25.9%)
160cm		70(13.8%)	97(19.2%)	23(4.5%)	2(0.4%)	1(0.2%)	193(38.1%)
165cm		40(7.9%)	40(7.9%)	11(2.2%)	0(0.0%)	1(0.2%)	92(18.2%)
170cm		9(1.8%)	10(2.0%)	2(0.4%)	0(0.0%)	1(0.2%)	22(4.3%)
175cm		0(0.0%)	3(0.6%)	0(0.0%)	0(0.0%)	0(0.0%)	3(0.6%)
total		186(36.8%)	252(49.8%)	57(11.3%)	3(0.6%)	8(1.6%)	506(100.0%)
S h a n g h a i	145cm	0(0.0%)	1(0.2%)	1(0.2%)	0(0.0%)	0(0.0%)	2(0.4%)
	150cm	5(1.0%)	19(3.8%)	4(0.8%)	0(0.0%)	0(0.0%)	28(5.5%)
	155cm	36(7.1%)	80(15.8%)	22(4.4%)	3(0.6%)	1(0.2%)	142(28.1%)
	160cm	35(6.9%)	122(24.2%)	27(5.3%)	6(1.2%)	1(0.2%)	191(37.8%)
	165cm	24(4.8%)	59(11.7%)	19(3.8%)	1(0.2%)	0(0.0%)	103(20.4%)
	170cm	6(1.2%)	18(3.6%)	3(0.6%)	1(0.2%)	0(0.0%)	28(5.5%)
	175cm	7(1.4%)	4(0.8%)	0(0.0%)	0(0.0%)	0(0.0%)	11(2.2%)
	total	113(22.4%)	303(60.0%)	76(15.0%)	11(2.2%)	2(0.4%)	505(100.0%)

The shaded part means 3.5% or more of distribution. person (%)

in Beijing and 22.4% in Shanghai) and B type (11.3% in Beijing and 15.02% in Shanghai) in their order.

In view of size and type combined, 160A accounted for most (19.2%) of the Beijing sample, followed by 155A(14.0%), 160Y(13.8%), 155Y(8.5%), 165A-165Y(7.9%) and 160B(4.5%), while 160A accounted for most (24.2%) of the Shanghai sample, followed by 155A(15.8%), 165A(11.7%), 155Y(7.1%), 160Y(6.9%), 160B(5.3%) and 165Y(4.8%) in their order.

In overall terms, the mean values of statures differed significantly between two regions, but the ratios of distribution at the major intervals (155, 160 and 165cm) were similar between them. To be more specific, A types were more distributed in Shanghai than Beijing, while Y types were relatively more distributed in Beijing than Shanghai. Such findings agree to the preceding

analysis that Beijing women developed the chest more than their Shanghai counterparts.

Based on the above findings, it could be concluded that in case of the young women in their 20's who will little have their body shapes changed because of their physical maturity, the body shapes are affected by geographic variables rather than passage of time.

Namely, it was analyzed that the young women group tend to show significant differences of their body shapes being affected by geographical variables more than aging. In consideration of the wide regional and racial variations of China and in reference to DPRK national standards (GB/T) set in terms of statures and body types combined, the researchers would like to suggest 160A, 155A and 160Y as their standard body types.

IV. Conclusion and Suggestions

This study aimed at providing some information about Chinese adult women's body measurements and standard body types to the Korean apparel businesses who have advanced into the Chinese apparel markets, while endeavoring to localize their businesses, and thereby, conducting to development and production of women's apparel well fitting the Chinese consumers in terms of measurements and shapes. To this end, the researchers sampled the Chinese adult women aged between 19 and 29 in Beijing and Shanghai and therewith, surveyed their upper body measurements and changes over time and thereupon, determined their standard body types. This study can be concluded as follows:

1. As a result of comparing the body measurements of the Chinese adult women in Beijing region in their 20's, it has been found that their vertical measurements including stature did not differ much over years, but that their waist circumference changed less than their chest and hip circumferences, which means that they look more slender with their smaller waist circumference. Over three years, their shoulder size did not much change, but it has been found that their upper body shape was pulled back less over years. Their weight and Rohrer index did not change much, and in terms of obesity index, the Beijing adult women had a normal upper body shape.

2. As a consequence of comparing the body measurements of the Chinese adult women in Shanghai region in their 20's over time, it has been found that their waist and hip height increased over years, while their stature did not

change much, which means that their upper body was shorter and their lower body was relatively longer. Over years, Shanghai adult women developed depths rather than breadths, which implies that their upper body shape was more round. Their weight and Rohrer index did not change much over years, and therefore, in terms of obesity, Shanghai women were rather slender than their Beijing counterparts (1.32).

3. As a result of comparing the entire body measurement data (about Beijing and Shanghai women in their 20's), it has been found that Beijing women's mean Rohrer index was 1.32, while Shanghai women's index was 1.27, which means that the latter group were more slender. Shanghai women showed larger vertical lengths than their Beijing counterparts except for the waist height, which can be interpreted as Shanghai women's higher chest position among the front proportions of upper body. Beijing women had thicker neck, and their chest and waist were deeper than their hip, which suggests that their upper body was rather round. It was also interpreted that Shanghai women had larger hip flatness ratio, which means that their hip and abdomen below waist line were deeper. It was analyzed that Shanghai women's upper body was more pulled back than their Beijing counterparts. All in all, the Chinese adult women's body shapes did little change or their body shape changes, if any, were deemed affected by geographical variables more than passage of time.

4. In consideration of the widest geographic and demographic variances of China and in reference to the Chinese Standards (GB/T) about combinations of statures and body types and based on the result of analyzing the

correlation distribution of Chinese adult women's upper body measurements, the researchers have determined 160A, 155A and 160Y as their standard body types.

As a result of comparing Chinese adult women's body measurements between regions and over years and examining the upper body measurements and types over years and comparing the measurements between the regions to identify the differences of body types and measurements between two regions, it has been found that changes of body types were affected more by regional variables than passage of time.

The researchers analyzed the correlation distribution of entire sample's statures and body types (Y, A, B and C depending on the drop measurements between chest and waist circumference) to determine the distributions of upper body sizes and comparatively analyzed the correlation distribution of statures and body types between Beijing and Shanghai to determine Chinese women's standard body types or 160A-155A-160Y.

In order to provide more useful data about Chinese adult women's body types to the Korean apparel enterprises doing business in China, it is hoped that this study will be followed up by future studies which will further analyze Chinese adult women's body measurements, sizes and their more detailed standard body types in comparison with their Korean counterparts. The researches plan to compare the body shapes between Chinese and Korean adult women to help the Korean apparel enterprises classify their body shapes, develop Dressform, apparel prototypes and patterns. Currently, the researchers are comparing the body measurements between Korean and

Chinese adult women in reference to 2004 Size Korea.

It should be noted that the most recent data were not used for this study. The researchers plan to continue to provide for the body shape information based on the regional studies over years.

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