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The study on the breast types and characteristics of Chinese female adults. (Ver. 1) +

- Focused on the female college students in Shanghai-

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Abstract

This study is done in Shanghai area by sample survey of female college students. Through direct contact survey, this study collected and analyzed information on figure to understand feature of breasts and measurements of body to provide base information to improve product of brassiere for adult female in China. Data was analyzed by using SPSSWIN 13.0 Program and SAS 9.0.

1. From a result of analysis on the body measures to understand the characteristics of the shape of the breast of the Chinese female college students(18~24 years old), the bust circumference was 83.86cm and the underbust circumference was 73.37cm and the cup size of a brassiere was 75A.
2. From a result of analysis on the bust measures to understand the relations between the front, lateral and cross-sectional proportions of the bust and the shape of the breast in the Chinese female college students, the chest height was 0.77, the bust height was 0.71 and the underbust height was 0.68 as the information of the body type that shows the location of the bust that is the measure of an item to a height as the front proportion of the bust. For the lateral proportion of the bust, the chest depth of the waist depth was 0.98, the bust depth, 1.21 and the underbust depth, 1.03. While the bust depth/waist depth is ideal when being 1.3, it was 1.21 in this study to be close to the ideal lateral shape. For the cross-sectional proportion of the bust, the area of the largest evenness was the bust followed by the waist, underbust and chest in order.
3. From a result of analysis on the correlation between measured items necessary to understand the characteristic of the shape of the breast, to set up the sizes and to produce the patterns, the underbust circumference had a relatively high correlation between the items of breadth, depth and circumference and weight as the items of basic areas.

Key Words : breast type, breast characteristics, proportion, brassiere

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Ⅰ. Introduction

After joining WTO in 2001, launching an automatic spacecraft in 2003, joining free trade circulation in 2005, hosting Beijing Olympic in 2008 and so on, China has built global level of consumer environment due to internal and external major businesses beginning in 2000. Therefore the world has noticed chinese potentials for large consumer market from its simple manufacturing production base. Chinese import and consumer market scale is recorded as increasing an average of 24% per year after 2000.[1)]

Furthermore, in 2017 China is predicted to clear away USA and will grow to be the world's biggest consumer market. Now in 2008, chinese clothing market scale is 5 hundred billion Yuan and in 2010 chinese middle class who is expected to be able to consume impractical luxury items may increase to 250 million people.[2)] Therefore, an outlook of luxury clothing market and luxury items consumption will increase. Consequently, there is a long development plan for future industry and a cut in low manufacturing products. China formed a clothing development plan that will advance their market to middle to high cost product market and introduce them into new changes of higher value-added brand market. Then, this will accelerate infinite growth of middle to high priced brands whose targets are middle class, and will strengthen upper level clothing industry.

Chinese consumers have high standard of senses due to higher education, various information input from advancement of mass media, increase in fashion standard, increase in quality of social economy activity and so on. Thus, it increased the interests in quality of fashion environment and excellence in products. And for clothing brands, product differentiation is a major concern also for those Korean clothing businesses in China in their development of products. In order to produce clothing that meets demands and standards of Chinese consumers there is a need to understand their sociocultural environment, consumers' preferences, actual purchases and uses, and information of their body figures. Based from those information one needs to develop creative and differentiable higher value-added products in order to strengthen the products. Plus, one needs to build systematic marketing plan to maximize sales productivity through target market segmentation and develop individual marketing line through long term investment plans.

Now in 2008, there are 74 Korean clothing brands in China. These are brands of casual clothes, male and female formal wear, sportswear, kids clothes, underwear, and accessories. Among these 74 brands there are only 6 brands of underwear. Even though Korean underwear have international competitiveness, due to its conservative nature, success story of export in China in underwear are rare. Chinese lingerie market has not only international licensed brands but as well as thousands of domestic lingerie manufacturing companies. But Chinese women's satisfaction of wearing lingerie products were low in general and especially for brassiere which requires fitting more important than any other clothing, the satisfaction level was even lower. This comes from incongruity of measurement and pattern when brassiere products were produced, and it suggest that we should develop a superior product that was produced by scientific research about body type and brassiere and then approach Chinese lingerie market. In order to let Korean enterprises advance into wide Chinese brassiere market

effectively, Korean companies should develop superior brassiere product with superior fitting that are based on scientific approach mode of bust type and its size toward adult women from consumption area and then heighten brassiere satisfaction of Chinese consumers.

On one side, chinese base study level for improvement of consumer satisfaction on brassiere fit is very weak compared to the number of underwear consumers and brands. Even in underwear industry manufacturing of brassiere production is not based on scientific research data from consumers' body figure but from a simple disassemble of foreign products and depend on designers'experience. Thus present situation is that brassieres are subjectively designed and manufactured.

As a result, this study is done in Shanghai area by sample survey of female college students. Through direct contact survey, this study collected and analyzed information on figure to understand feature of busts and measurements of body to provide base information to improve product of korean company's brassiere for adult female in China.

II. Methods of Study and Procedures

1. Subjects of Measurement

In order to collect this study's body survey data, 210 female students attending Shanghai Donghua University are sampled for body measurements by simple random sampling. Only 208 females are used in the study excluding females who had extreme measurements. Subjects divided three groups for recognizing the growth degrees.

2. Term and Place of Measurement

In order to collect body survey data, through Jan 3~Jan 16, 2008 Korea Sookmyung Women's University clothing organization lab and through Jan 21~Jan 24, 2008 China Shanghai Donghua University clothing institute human body technology lab have done a preliminary survey experiments. In Donghua University preliminary survey experiments, one professor from each university and 3 and 6 graduate students from Korea and China, total of 11 people have participated. One professor and 6 graduate students from Donghua University have executed this survey during Feb 20~Mar 30, 2008.

3. Methods and categories of Measurement

Martin Anthropometic Instrument is used as a survey instrument and survey method is done in accordance with Martin Anthropometic body survey. Standard line and standard point of body survey is established based on 2004 National physical standard research report, KS A 7003 and KS A 7004, and terms based on body measurement standard vocabulary and previous brassiere research data of 5th Korean body measurement research (Size Korea).[4)5)6)] The number of survey itemizations in analysis of bust type for adult female in China are 40 itemizations including 1 item in weight, 4 items in region of height, 4 items in region of width, 4 items in region of depth, 4 items in region of circumference, 5 items in region of length, 14 items in region of bust detail, and 4 items in region of angle. Upper body measurement analysis according to the actual bust shape.

4. Methods of Data Process and Analysis

Data analysis according to this research were

done by SPSSWIN 13.0 Program and SAS 9.0, it analyzed both dispersion analysis and correlation in order to analyze body traits of adult women.

III. Results

1. analysis of the upper body measurements

1) analysis of the upper body measurements in substance breast

With Chinese female college students(18~24 of age), to understand the characteristics of bust shapes in nude, we divided the upper body measurements 40 categories and calculation/ index 4 categories into height, width, circumference, length, detail categories around bust part, angle, and weight, and analyzed them. We stated the body measurements of the total objects in <Table 1>, calculated average values for each age group to analyze the transformation pattern of bust shapes for each age group, and performed F-test and Duncan-test to verify the differences between age groups and stated them in <Table 2>.

(1) Height categories

As a result of analysis of vertical categories related to the location of busts, the total average height was 160.93cm, chest height 124.03cm, bust height 114.74cm, and underbust height was 109.29cm. There is no noticeable difference between age groups, and this is probably because the range of the age group is too narrow. Chest height, bust height, and underbust height are related to the height, and if she is tall, the chest location is high, and if she is short, the chest location is low.

(2) Width categories

Looking into the width/depth category related to fatness and flat ratio, you can find the chest width average of 28.39cm, bust width 26.51cm, underbust width 25.33cm, and waist width of 23.90cm. depth category showed chest depth of 17.39cm, bust depth 21.53cm, underbust depth 18.20cm, and waist depth of 17.62cm.

There was a noticeable difference between the age group of 18~20 and the age group of 21~22, 23~24, and the age group of 18~20 showed bigger width and depth.

(3) Circumference categories

As a result of analysis on circumference indicating the fatness of breast part and the volume, chest circumference was 82.14cm, bust circumference 83.86cm, waist circumference 67.86cm, and the brassiere cup was 75A. The difference between bust and waist circumference decreased as age increased, and it was analyzed as the curve of the waist becomes flat and body slowly becomes H figure.

(4) Length categories

As a result of analysis on neck shoulder point to bust point length, shoulder center point to bust point length and nipple, lateral shoulder to bust point length, neck shoulder point to bust point to waist length, and lateral shoulder to bust point to waist length that show the drooping of the breasts, there was no noticeable difference between age groups, and 23~24 showed even shorter length than 18~20, but it is related to the height, that is the height of 23~24 is shorter than 18~20 group so the length came out shorter, and it has nothing to do with the drooping of the breasts.

(5) Detail categories of breasts

As a result of analysis on detail categories of breasts that show bust widening/drooping, base area dimension, volume, and projection, bust point to bust point length was average of 18.78cm, 19.25cm for 18~20, 18.82cm for 21~22, and 18.48cm for 23~34, and it showed that the bust point to bust point length was shorter as the age is lower. This is because the growth is not completed at the age of 18~20. Breasts in adolescent period points more to the outside than adults, and as one becomes an adult, width becomes larger compared to the depth, so it becomes more flat and the breasts gather more to the center.[7] Therefore, the bust point to bust point length shortens as one completes her growth, and the gap between nipples widens as one grows older.

(6) Angle categories

There was no noticeable difference in angle category, but it showed a noticeable difference in Röhrer index which showed higher value in 21~22 than 23~24. This is due to the breast volume and projection becomes larger as the body fatness becomes bigger. Comparing the above results and previous studies, there was no large difference because the age group was 18~24, but we can find that 18~20 still has many characteristics of adolescent because of incomplete growth, and the growth becomes complete as one gets to 21.

Through each relation of bust size analyze, breast shape divided to five shapes, flat, cone, dome, protrusion, sag.

2) analysis of the upper body measurements in recognition breast

(1) recognition of people being measured of breast shape for each age group

As a result of looking into the analysis of upper body measurements according to the recognized breast shapes / objects' awareness of breast shapes according to each age group / objects' awareness of breast shapes of Chinese female college students, the most recognition was cone shape, and in the order of dome shape, projection shape, and sag shape.

(2) recognition of measurer of breast shape for each age group

Different from the breast shape that the objects are aware of, there were more flat shapes than dome shape, and sag shape was 3.4 % which was more than the objects' awareness rate.

<Table 1> Measurements of upper bodies of all of the study objects

category	Item(cm)	Average	Standard deviation	The minimum value	The maxium value	variation Calculation	Range
Height	Status	160.93	5.68	146.10	176.70	3.53	30.60
	Chest Height	124.03	5.12	111.20	137.90	4.13	26.70
	Bust Height	114.74	5.15	101.80	130.20	4.49	28.40
	Under Bust Height	109.29	4.97	97.20	123.70	4.55	26.50
Width	Chest Width	28.39	1.56	24.70	32.60	5.50	7.90
	Bust Width	26.51	1.59	22.30	31.30	5.99	9.00
	Under Bust Width	25.33	1.51	22.10	30.60	5.95	8.50
	Waist Width	23.90	1.81	20.40	29.60	7.56	9.20
Depth	Chest Depth	17.39	1.28	13.80	21.50	7.34	7.70
	Bust Depth	21.53	2.01	16.30	27.60	9.32	11.30
	Under Bust Depth	18.20	1.69	14.10	24.00	9.26	9.90
	Waist Depth	17.62	1.65	14.60	24.60	9.35	10.00
Circumference	Chest Circumference	82.14	4.76	70.00	95.10	5.80	25.10
	Bust Circumference	83.86	5.86	71.40	99.70	6.98	28.30
	Under Bust Circumference	73.37	4.37	62.80	86.00	5.96	23.20
	Waist Circumference	67.86	5.17	57.70	85.20	7.61	27.50
Length	Neck Shoulder Point to Bust Point Length	25.85	2.15	21.50	36.00	8.31	14.50
	Neck Shoulder Point to Bust Point to Waist Length	39.70	2.25	30.00	46.50	5.67	16.50
	Shoulder Center Point to Bust Point Length	23.22	1.98	19.00	31.20	8.54	12.20
	Lateral Shoulder to Bust Point Length	22.25	1.84	18.30	28.50	8.25	10.20
	Lateral Shoulder to Bust Point to Waist Length	38.65	2.06	34.00	44.80	5.34	10.80
Relation of bust	Bust point to bust point Length	18.78	1.65	15.00	24.40	8.78	9.40
	Bust Inner point to Bust Inner Point Length	2.19	0.81	0.30	4.30	36.99	4.00
	Side Line-Bust External point Length	3.29	0.88	1.00	5.70	26.90	4.70
	Bust Inner Side Diameter	7.74	0.88	4.90	10.70	11.36	5.80
	Bust External Side Diameter	5.34	1.25	2.50	9.70	23.49	7.20
	Bust Upper Side Diameter	9.21	1.79	4.30	17.10	19.41	12.80
	Bust Under Side Diameter	5.34	1.04	2.80	8.50	19.49	5.70
	Bust Inner Side Length	8.59	1.23	4.00	13.00	14.28	9.00
	Bust External Side Length	10.44	1.69	6.50	15.50	16.16	9.00
	Bust Upper Side Length	10.50	1.97	5.40	19.00	18.75	13.60
	Bust Under Side Length1	6.99	1.32	4.30	12.20	18.89	7.90
	Bust Under Side Length 2	7.00	1.49	4.30	19.00	21.26	14.70
	Bust Under Outline Length	20.23	1.96	15.50	25.20	9.68	9.70
	Bust Depth	2.41	0.96	0.50	5.50	40.09	5.00
	Bust Upper Side Slope(°)	27.84	6.55	10.00	45.00	23.52	35.00
	Bust Under Side Slope(°)	31.28	9.32	10.00	67.00	29.78	57.00
	Bust Inner Side Slope(°)	12.25	5.96	3.00	34.00	48.65	31.00
	Bust External Side Slope(°)	61.27	7.19	40.00	78.00	11.73	38.00
The Others	Weight(kg)	52.16	6.41	38.00	72.50	12.28	34.50
	Bust Circumference-Waist Circumference	16.00	3.25	4.40	23.70	20.31	19.30
	Bust Circumference-Under Bust Circumference	10.49	3.03	1.30	19.10	28.88	17.80
	Chest Circumference-Bust Circumference	-1.72	3.12	-12.80	5.60	181.39	18.40
	Index of Röhrer	1.25	0.15	0.95	1.77	12.19	0.82

<Table 2> Comparative Analysis of upper body measurements for each age group

Item(cm) \ Age		18~20 years (n=39)		21~22 years (n=95)		23~24 years (n=74)		F-test	Duncan-test
		Average	Standard deviation	Average	Standard deviation	Average	Standard deviation		
Height	Status	160.86	5.37	161.61	6.00	160.09	5.37	1.49	
	Chest Height	123.96	4.78	124.59	5.39	123.35	4.90	1.23	
	Bust Height	114.43	5.01	115.47	5.28	113.97	4.98	1.87	
	Under Bust Height	109.48	4.79	109.85	5.28	108.49	4.62	1.59	
Width	Chest Width	28.97	1.44	28.24	1.59	28.28	1.54	3.45*	a b b
	Bust Width	27.06	1.56	26.27	1.45	26.54	1.72	3.54*	a b b
	Under Bust Width	26.05	1.71	25.07	1.30	25.29	1.54	6.18**	a b b
	Waist Width	24.60	2.05	23.60	1.56	23.91	1.89	4.38*	a b b
Depth	Chest Depth	18.04	1.39	17.31	1.12	17.16	1.31	6.76**	a b b
	Bust Depth	22.58	2.38	21.33	1.87	21.22	1.80	7.04**	a b b
	Under Bust Depth	18.84	2.01	18.03	1.57	18.09	1.58	3.53*	a b b
	Waist Depth	18.50	1.78	17.30	1.45	17.56	1.67	7.87**	a b b
Circumference	Chest Circumference	83.96	5.45	82.01	4.25	81.36	4.81	3.97*	a b b
	Bust Circumference	86.44	6.91	83.27	5.17	83.26	5.79	4.82**	a b b
	Under Bust Circumference	75.12	4.55	72.67	4.06	73.34	4.45	4.52*	a b b
	Waist Circumference	70.19	5.76	66.88	4.36	67.90	5.46	5.97**	a b b
Length	Neck Shoulder Point to Bust Point Length	26.67	2.46	25.69	2.13	25.62	1.91	3.67*	a b b
	Neck Shoulder Point to Bust Point to Waist Length	39.89	2.74	39.91	2.10	39.31	2.13	1.68	
	Shoulder Center Point to Bust Point Length	23.88	2.21	22.99	1.90	23.16	1.91	2.87	
	Lateral Shoulder to Bust Point Length	22.78	1.99	22.07	1.81	22.21	1.76	2.10	
	Lateral Shoulder to Bust Point to Waist Length	38.69	2.05	38.76	2.20	38.48	1.90	0.40	
Relation of bust	Bust point to bust point Length	19.25	1.83	18.82	1.56	18.48	1.62	2.84	
	Bust Inner point to Bust Inner Point Length	2.51	1.41	2.15	0.76	2.21	0.92	1.95	
	Side Line-Bust External point Length	3.26	0.80	3.35	0.84	3.23	0.98	0.40	
	Bust Inner Side Diameter	7.86	0.78	7.82	0.91	7.58	0.88	2.11	
	Bust External Side Diameter	5.58	1.28	5.11	1.07	5.49	1.41	2.86	
	Bust Upper Side Diameter	9.32	2.08	9.08	1.62	9.32	1.84	0.48	
	Bust Under Side Diameter	5.37	1.18	5.36	1.04	5.29	0.98	0.12	
	Bust Inner Side Length	8.90	1.25	8.69	1.23	8.30	1.17	3.71*	a ab b
	Bust External Side Length	10.99	2.09	10.24	1.59	10.40	1.52	2.84	
	Bust Upper Side Length	10.68	2.53	10.40	1.77	10.53	1.89	0.29	
	Bust Under Side Length1	7.65	1.48	6.93	1.31	6.72	1.13	6.90**	a b b
	Bust Under Side Length 2	7.44	1.23	6.90	1.27	6.88	1.81	2.13	
	Bust Under Outline Length	20.13	1.84	20.05	2.58	20.25	2.04	0.16	
	Bust Depth	2.68	1.13	2.41	0.92	2.26	0.91	2.38	
	Bust Upper Side Slope(°)	28.52	6.89	27.70	6.69	27.66	6.24	0.26	
	Bust Under Side Slope(°)	33.00	10.27	31.16	8.89	30.54	9.34	0.90	
	Bust Inner Side Slope(°)	12.69	6.08	12.25	6.16	11.99	5.73	0.18	
	Bust External Side Slope(°)	59.62	7.23	62.52	6.86	60.54	7.39	2.90	
The Others	Weight(kg)	54.01	6.60	51.76	6.31	51.70	6.35	2.01	
	Index of Röhrer	1.30	0.16	1.23	0.15	1.26	0.15	3.23*	a ab b

*p≤.05 **p≤.01, ***p≤.001

Groups with noticeable differences with Duncan-test verification result of *p≤.05 level are marked by different alphabets(a>b>c>d).

<Table 3> recognition of people being measured of breast shape for each age group

Age / bust Shape	18~20	21~22	23~24	Total	χ^2 *df*
flat	12 (30.8)	34 (35.8)	22 (29.7)	68 (32.7)	6.13 8
cone	19 (48.7)	41 (43.2)	31 (41.9)	91 (43.8)	
dome	4 (10.3)	17 (17.9)	14 (18.9)	35 (16.8)	
protrusion	3 (7.7)	3 (3.2)	5 (6.8)	11 (5.3)	
sag	1 (2.6)	0 (0.0)	2 (2.7)	3 (1.4)	
Total	39 (100.0)	95 (100.0)	74 (100.0)	208 (100.0)	

*p≤.05

<Table 4> recognition of measurer of breast shape for each age group

Age / bust Shape	18~20	21~22	23~24	Total	χ^2 *df*
flat	14 (35.9)	45 (47.4)	32 (43.2)	91 (43.8)	17.48* 8
cone	9 (23.1)	34 (35.8)	28 (37.8)	71 (34.1)	
dome	5 (12.8)	11 (11.6)	8 (10.8)	24 (11.5)	
protrusion	8 (20.5)	3 (3.2)	4 (5.4)	15 (7.2)	
sag	3 (7.7)	2 (2.1)	2 (2.7)	7 (3.4)	
Total	39 (100.0)	95 (100.0)	74 (100.0)	208 (100.0)	

*p≤.05

<Table 5> Difference in understandings of breast types between measurers and people being measured

(Unit: person, %)

people being measured / measurer	flat	cone	dome	protrusion	sag	Total
flat	56 (61.5)	21 (23.1)	13 (14.3)	1 (1.1)	0 (0.0)	91 (100.0)
cone	10 (14.1)	46 (64.8)	10 (14.1)	5 (7.0)	0 (0.0)	71 (100.0)
dome	2 (8.3)	12 (50.0)	10 (41.7)	0 (0.0)	0 (0.0)	24 (100.0)
protrusion	0 (0.0)	8 (53.3)	2 (13.3)	3 (20.0)	2 (13.3)	15 (100.0)
sag	0 (0.0)	4 (57.1)	0 (0.0)	2 (28.6)	1 (14.3)	7 (100.0)
Total	68 (83.9)	91 (248.3)	35 (82.4)	11 (56.7)	3 (27.6)	208 (500.0)

<Table 6> people being measured of upper body measurement for breast shape

Item(cm) \ bust Shape		flat (n=68)		cone (n=91)		dome (n=35)		protrusion (n=11)		sag (n=3)		F-test	Duncan-test
		average	Standard deviation	average	Standard deviation	average	Standard deviation	average	Standard deviation	average	Standard deviation		
Height	Status	161.53	5.26	160.56	5.87	161.09	6.56	160.13	4.21	159.53	4.17	0.39	
	Chest Height	124.34	4.65	123.77	5.34	124.38	6.03	123.68	3.20	122.03	4.36	0.28	
	Bust Height	115.57	4.64	114.15	5.46	115.54	5.69	112.94	2.89	111.03	1.05	1.70	
	Under Bust Height	110.18	4.55	108.63	5.18	109.69	5.65	108.28	3.08	108.23	3.04	1.15	
Width	Chest Width	28.13	1.48	28.52	1.59	28.43	1.68	28.49	1.55	29.50	0.62	1.03	
	Bust Width	25.72	1.42	26.89	1.45	26.65	1.80	27.36	1.02	28.47	0.38	8.64***	c bc ab ab a
	Under Bust Width	24.78	1.50	25.60	1.47	25.33	1.48	26.18	1.14	26.43	0.12	4.58**	b b ab ab a
	Waist Width	23.25	1.63	24.14	1.82	24.02	1.85	24.95	1.31	25.97	1.75	4.89**	c bc ab ab a
Depth	Chest Depth	17.13	1.37	17.46	1.24	17.51	1.20	17.87	.99	18.10	1.47	1.47	
	Bust Depth	20.33	1.61	22.07	1.97	21.75	1.76	23.09	1.89	23.77	1.06	12.86***	c bc ab ab a
	Under Bust Depth	17.63	1.65	18.28	1.68	18.85	1.65	18.79	1.30	18.97	0.57	3.97**	b b b ab a
	Waist Depth	16.96	1.53	17.90	1.56	17.71	1.75	18.75	1.62	18.83	0.32	5.51***	b b ab ab a
Circumference	Chest Circumference	80.35	4.69	82.68	4.37	82.87	5.24	85.01	2.77	87.73	4.08	5.36***	c bc ab ab a
	Bust Circumference	80.09	4.70	85.61	5.45	84.54	5.36	88.71	5.17	90.70	4.12	15.51***	b ab ab ab a
	Under Bust Circumference	71.73	4.44	73.91	4.10	74.01	4.44	76.26	3.25	76.10	1.65	4.76**	b b ab ab a
	Waist Circumference	65.92	4.60	68.62	5.17	68.11	5.22	71.30	4.77	73.37	2.78	5.41***	c bc ab b a
Length	Neck Shoulder Point to Bust Point Length	24.84	1.55	26.42	2.25	25.48	1.66	27.69	2.05	28.90	3.93	10.98***	c bc a ab a
	Neck Shoulder Point to Bust Point to Waist Length	39.00	2.07	39.90	2.23	40.12	2.37	40.10	1.60	42.90	3.17	3.92**	b a a a a
	Shoulder Center Point to Bust Point Length	22.30	1.34	23.76	2.08	22.77	1.62	25.08	1.94	26.17	3.25	11.95***	c ab b ab a
	Lateral Shoulder to Bust Point Length	21.64	1.42	22.62	1.94	21.83	1.63	23.72	1.90	24.83	2.25	7.31***	c ab b ab a
	Lateral Shoulder to Bust Point to Waist Length	38.21	1.98	38.72	1.89	38.99	2.56	38.91	1.75	41.20	1.66	2.30	
Relation of bust	Bust point to bust point Length	17.99	1.39	19.17	1.61	18.97	1.47	19.68	2.25	19.00	2.18	6.83***	b ab ab a ab
	Bust Inner point to Bust Inner Point Length	2.36	0.71	2.20	0.83	1.85	0.86	2.12	0.85	1.83	1.04	246*	
	Side Line-Bust External point Length	3.33	0.96	3.19	0.82	3.30	0.80	3.55	1.18	4.10	0.66	1.21	
	Bust Inner Side Diameter	7.24	0.70	7.98	0.80	7.95	0.75	8.14	1.44	8.07	1.31	9.95***	b a a a a
	Bust External Side Diameter	4.98	1.04	5.52	1.29	5.30	1.27	5.75	1.52	6.83	1.31	3.42*	b b b b a
	Bust Upper Side Diameter	8.37	1.39	9.66	1.79	9.02	1.64	10.75	1.81	10.87	2.99	9.27**	b ab b a a
	Bust Under Side Diameter	5.11	0.75	5.41	1.07	5.79	1.08	5.07	1.52	4.10	1.35	4.07**	a a a a b
	Bust Inner Side Length	7.86	0.90	8.93	1.07	8.67	1.07	9.60	1.90	10.10	2.76	13.57***	c b bc ab a
	Bust External Side Length	9.26	0.98	11.08	1.60	10.51	1.39	11.43	2.38	13.30	1.47	20.07***	c b b b a
	Bust Upper Side Length	9.45	1.39	11.15	1.96	10.11	1.71	12.24	1.97	12.57	3.49	13.18***	c b bc ab a
	Bust Under Side Length1	6.12	0.71	7.41	1.30	7.21	1.17	7.85	1.83	8.50	2.23	15.32***	c b b ab a
	Bust Under Side Length2	6.12	0.71	7.33	1.24	7.21	1.17	7.59	1.48	11.97	6.09	22.72***	c b b b a
	Bust Under Outline Length	19.33	1.69	20.53	1.80	21.23	2.14	20.22	2.41	19.77	0.93	7.22***	b a a a b
	Bust Depth	1.83	0.61	2.73	0.97	2.34	0.73	3.04	1.33	3.97	1.16	15.08***	c b bc b a
	Bust Upper Side Slope(°)	24.16	4.77	30.29	6.56	27.98	6.22	29.91	7.50	27.73	6.54	10.42***	b ab ab a a
	Bust Under Side Slope(°)	27.44	7.36	34.50	9.46	28.06	6.98	34.91	11.01	45.33	13.43	10.36***	b b b b a
	Bust Inner Side Slope(°)	10.01	4.59	13.81	6.34	12.09	5.56	11.91	5.68	18.67	11.02	5.25***	b ab b b a
	Bust External Side Slope(°)	60.30	6.48	61.40	7.63	63.03	6.50	62.18	6.87	55.67	15.04	1.35	
The Others	Weight(kg)	49.68	5.96	53.00	6.24	53.08	6.89	56.32	4.34	57.00	4.36	5.08**	b ab ab a a
	Bust Circumference -Waist Circumference	14.17	2.55	16.98	3.36	16.43	2.81	17.41	2.26	17.33	5.91	9.66***	b a ab a a
	Bust Circumference -Under Bust Circumference	8.36	1.96	11.70	2.90	10.53	2.36	12.45	3.70	14.60	3.80	19.78***	c b bc ab a
	Chest Circumference -Bust Circumference	0.26	2.46	-2.93	2.86	-1.67	2.66	-3.70	4.11	-2.97	3.20	14.43***	a b ab b b
	Index of Röhrer	1.18	0.13	1.28	0.15	1.27	0.14	1.38	0.14	1.40	0.04	8.78***	b ab ab a a

*p≤.05 **p≤.01, ***p≤.001

Groups with noticeable differences with Duncan-test verification result of *p≤.05 level are marked by different alphabets(a>b>c>d).

<Table 7> measurer of upper body measurement for breast shape

Item(cm) \ bust Shape		flat (n=91)		cone (n=71)		dome (n=24)		protrusion (n=15)		sag (n=7)		F-test	Duncan-test
		average	Standard deviation	average	Standard deviation	average	Standard deviation	average	Standard deviation	average	Standard deviation		
Height	Status	161.55	5.83	160.56	5.60	160.79	5.91	159.23	4.20	160.76	6.87	0.69	
	Chest Height	124.22	5.22	124.01	5.09	124.46	5.32	122.66	3.89	123.17	6.50	0.39	
	Bust Height	115.60	5.28	114.39	5.01	115.30	5.20	112.02	3.40	111.01	4.92	2.85*	a ab a ab b
	Underbust Height	110.22	5.19	108.77	4.71	109.21	5.11	107.07	3.52	107.67	5.47	1.95	
Width	Chest Width	28.11	1.45	28.46	1.75	28.63	1.29	29.12	1.47	28.99	1.42	2.03	
	bust width	25.83	1.39	26.81	1.51	26.73	1.25	28.07	1.55	28.27	1.23	13.33***	c b bc a a
	underbust width	24.86	1.37	25.46	1.46	25.52	1.26	26.49	1.30	26.93	2.26	7.44***	b b b a a
	Waist width	23.27	1.49	24.05	1.72	24.11	1.60	25.67	1.77	26.06	2.78	10.78***	b b b a a
depth	Chest depth	17.32	1.36	17.30	1.22	17.34	1.07	17.99	0.96	18.20	1.70	1.74	
	Bust depth	20.50	1.49	21.90	1.97	21.93	1.57	23.95	1.45	24.56	1.46	23.26***	c b b a a
	Underbust depth	17.90	1.58	18.25	1.73	18.34	1.68	18.79	1.46	19.87	2.04	3.06*	b b b ab a
	Waist depth	17.15	1.39	17.74	1.67	17.68	1.43	19.03	1.50	19.37	2.59	7.52***	b b b a a
Circumference	Chest Circumference	80.64	4.29	82.86	4.96	82.61	3.80	85.90	4.85	84.83	4.88	6.21***	c ab bc a ab
	Bust Circumference	80.60	4.29	85.28	5.65	85.07	4.24	91.20	4.40	92.04	4.15	26.33***	c b b a a
	Underbust Circumference	72.18	4.05	73.63	4.57	73.79	3.56	77.17	2.75	76.56	5.60	6.14***	b b b a a
	Waist Circumference	66.11	4.17	68.35	5.27	68.19	4.39	72.84	4.81	73.90	7.38	10.22***	b b b a a
Length	Neck Shoulder Point to Bust point Length	24.83	1.51	26.23	2.03	26.04	1.32	27.81	2.23	30.36	2.76	23.88***	d c c b a
	Neck Shoulder Point to Bust Point to Waist Length	39.18	2.14	39.92	1.95	39.91	1.99	40.44	3.65	41.83	1.95	3.60**	b b b ab b
	Shoulder Center Point to Bust Point Length	22.24	1.35	23.60	1.97	23.43	1.24	25.17	1.89	27.20	2.10	24.70***	d c c b a
	Lateral Shoulder to Bust Point Length	21.46	1.45	22.63	1.87	22.27	1.29	23.87	1.60	25.11	2.09	15.52***	d c c b a
	Lateral Shoulder to Bust Point to Waist Length	38.30	2.09	38.81	1.90	38.55	2.37	39.73	1.89	39.51	1.78	2.17	
Detail categories related to breasts	Bust point to bust point length	18.19	1.40	19.03	1.58	19.05	1.38	19.51	1.90	21.44	1.84	10.43***	c bc bc b a
	Bust inner point to bust inner point length	2.41	0.68	2.13	0.82	1.57	0.76	1.81	0.89	2.71	0.97	7.80***	c b b bc a
	Side line-Bust External point length	3.35	0.86	3.23	0.93	3.17	0.84	3.48	0.78	3.03	1.18	0.64	
	Bust inner side Diameter	7.38	0.77	7.83	0.82	8.15	0.51	8.28	1.03	9.00	1.15	12.48***	c bc b b a
	Bust external side Diameter	4.99	1.14	5.37	1.22	5.59	1.27	6.32	1.01	6.51	1.64	6.51***	a a bc ab a
	Bust upper side Diameter	8.28	1.44	9.65	1.50	9.45	1.34	10.86	1.56	12.33	2.59	22.36***	d c c b a
	Bust under side Diameter	5.07	0.78	5.48	1.02	6.15	0.85	5.39	1.54	4.43	1.72	7.74***	b b a b c
	Bust inner side Length	7.91	0.95	8.73	0.94	9.22	0.59	9.85	1.34	11.16	1.43	33.05***	d c bc b a
	Bust External side Length	9.29	0.95	10.91	1.40	11.01	1.17	12.59	1.51	13.94	1.14	52.08***	d c c b a
	Bust upper side Length	9.28	1.48	11.15	1.47	10.83	1.38	12.47	1.76	14.36	2.48	35.57***	d c c b a
	Bust under side Length1	6.17	0.78	7.29	1.15	7.51	0.94	8.35	1.33	9.90	1.10	40.66***	d c c b a
	Bust under side Length2	6.17	0.78	7.27	1.13	7.51	0.94	8.93	3.00	8.94	1.35	26.11***	c b b a a
	Bust under outline length	19.49	1.76	20.63	1.83	21.62	1.88	20.68	2.17	20.03	1.99	8.20***	b ab a ab b
	Bust depth	1.81	0.61	2.63	0.77	2.67	0.82	3.68	0.86	4.29	0.98	41.28***	d c c b a
	Bust upper side slope(°)	24.41	4.85	29.65	6.65	31.08	4.68	33.28	7.04	31.29	7.91	15.58***	b a a a a
	Bust under side slope(°)	26.51	7.43	34.10	7.79	32.25	6.39	39.21	8.30	44.57	18.26	18.73***	d bc c b a
	Bust inner side slope(°)	9.70	4.40	14.30	6.13	13.71	6.27	13.93	6.13	16.00	8.74	8.75***	b a a a a
	Bust external side slope(°)	60.05	7.04	63.08	6.60	62.75	7.47	59.07	7.79	58.43	9.16	2.76*	ab a a b b
The others	Weight(kg)	50.14	5.69	53.01	6.87	52.83	5.52	55.70	5.13	60.00	5.13	7.17***	c bc bc b a
	Bust circumference -Waist Circumference	14.49	2.66	16.92	3.03	16.88	3.08	18.36	3.72	18.14	4.02	11.45***	b a a a a
	Chest circumference -Underbust Circumference	8.42	1.69	11.65	2.56	11.28	2.63	14.03	2.94	15.49	2.69	42.03***	c b b a a
	Chest circumference -Bust Circumference	0.04	2.37	-2.41	2.64	-2.46	2.23	-5.30	3.03	-7.21	2.89	28.86***	a b b c d
	Röhrer Index	1.19	0.12	1.28	0.16	1.27	0.13	1.38	0.11	1.45	0.21	12.47***	b b b a a

*p≤.05 **p≤.01, ***p≤.001

Groups with noticeable differences with Duncan-test verification result of *p≤.05 level are marked by different alphabets(a>b>c>d).

2. analysis of the upper body index

To understand the relationships between Chinese women of lower 20's upper body front/side/cross sectional proportion and the shape of breasts, we analyzed the upper body measurements, calculated average and standard deviations, and performed F-test and Duncan test and stated in <Table 8>.

1) Proportions of upper body front side

As a result of analysis of the values of 10 categories on height and waist width to understand the proportion of upper body front, the figurative information which indicates the location of breast - a height category value compared to the height - showed the chest height of 0.77, bust height of 0.71, and under bust height of 0.68 , and there is little difference between age groups therefore showing no difference between age groups.

<Table 8> Analysis of upper body index for each age group

(unit: cm)

Item	Age	18~20 (n=39)		21~22 (n=95)		23~24 (n=74)		F-test	Duncan-test			Total	
		Average	Standard deviation	Average	Standard deviation	Average	Standard deviation					Average	Standard deviation
Proportions of upper body front side	chest height/status	0.77	0.01	0.77	0.01	0.77	0.01	0.03				0.77	0.01
	bust height/status	0.71	0.01	0.71	0.01	0.71	0.01	1.17				0.71	0.01
	underbust height/status	0.68	0.01	0.68	0.01	0.68	0.01	0.90				0.68	0.01
	chest width/status	0.18	0.01	0.17	0.01	0.18	0.01	5.04**	a	b	b	0.18	0.01
	bust width/status	0.17	0.01	0.16	0.01	0.17	0.01	4.38*	a	b	ab	0.17	0.01
	underbust width/status	0.16	0.01	0.16	0.01	0.16	0.01	6.07**	a	b	b	0.16	0.01
	waist width/status	0.15	0.01	0.15	0.01	0.15	0.01	4.93**	a	b	ab	0.15	0.01
	chest width/waist width	1.18	0.08	1.20	0.08	1.19	0.07	0.88				1.19	0.07
	bust width/waist width	1.10	0.05	1.11	0.05	1.11	0.06	0.66				1.11	0.06
	underbust width/waist width	1.06	0.05	1.06	0.05	1.06	0.05	0.15				1.06	0.05
Proportions of upper body side	chest depth/status	0.11	0.01	0.11	0.01	0.11	0.01	6.04**	a	b	b	0.11	0.01
	bust depth/status	0.14	0.02	0.13	0.01	0.13	0.01	6.57**	a	b	ab	0.13	0.01
	underbust depth/status	0.12	0.01	0.11	0.01	0.11	0.01	3.82*	a	b	b	0.11	0.01
	waist depth/status	0.12	0.01	0.11	0.01	0.11	0.01	7.88**	a	b	b	0.11	0.01
	chest depth/waist depth	0.98	0.08	1.00	0.07	0.98	0.08	2.73				0.98	0.08
	bust depth/waist depth	1.22	0.08	1.24	0.08	1.21	0.08	1.75				1.21	0.08
	underbust depth/waist depth	1.02	0.07	1.04	0.07	1.03	0.07	1.82				1.03	0.07
the proportion of upper body cross section	chest depth/chest width	0.62	0.05	0.61	0.05	0.61	0.04	1.54				0.61	0.04
	bust depth/bust width	0.83	0.06	0.81	0.05	0.80	0.05	4.97**	a	b	b	0.80	0.05
	underbust depth/ underbust width	0.72	0.06	0.72	0.05	0.72	0.05	0.27				0.72	0.05
	waist depth/waist width	0.75	0.04	0.73	0.04	0.73	0.04	2.90				0.73	0.04
	chest circumference/ waist circumference	1.20	0.06	1.23	0.05	1.20	0.05	7.56**	a	b	b	1.20	0.05
	bust circumference/ waist circumference	1.23	0.05	1.25	0.05	1.23	0.05	2.67				1.23	0.05
	underbust circumference/ waist circumference	1.07	0.04	1.09	0.04	1.08	0.04	2.10				1.08	0.04
	chest circumference/status	0.52	0.04	0.51	0.03	0.51	0.03	3.28*	a	b	b	0.51	0.03
	bust circumference/status	0.54	0.05	0.52	0.03	0.52	0.04	4.65*	a	b	b	0.52	0.04
	underbust circumference /status	0.47	0.03	0.45	0.03	0.46	0.03	5.22**	a	b	ab	0.46	0.03
	waist/status	0.44	0.04	0.41	0.03	0.42	0.04	6.47**	a	b	b	0.42	0.04

*p≤.05 **p≤.01, ***p≤.001

Groups with noticeable differences with Duncan-test verification result of *p≤.05 level are marked by different alphabets(a>b>c>d).

2) proportions of upper body side

As a result of analysis of the values of 7 categories on height and waist depth to understand the proportion of upper body side, it showed chest depth of 0.98, bust depth 1.21, depth of under bust of 1.03 of waist depth. Shinyoung Wacoal Co.'s data on Torso Balance[8]says bust depth / waist depth of 1.3 is ideal ratio, and this study shows 1.21 which is close to ideal side figure, which is probably because the study targeted lower 20's which is the age that the growth of the body is physically completed. From under bust to waist are 1.03, which is almost no difference showing that it is a flat figure.

3) proportions of upper body cross section

The result of analysis of depth/width, circumference/waist circumference, and circumference /height to understand the proportion of upper body cross section is as follows.

(1) depth/width

As a result of analyzing 4 parts using flat ratio(depth/width) which indicates the cross sectional value, the highest flat ratio was found in breast part, and in the order of waist, under bust, and chest.

(2) circumference/waist circumference, and circumference/height

As a result of analysis of 7 categories on circumference category of waist circumference and circumference category of height, it showed chest circumference against waist circumference of 1.20, Bust circumference of 1.23, and underbust circumference of 1.08, and as the same as depth, waist circumference and underbust circumference showed little difference maintaining flat figure. The ratio of circumference category on height showed chest circumference of 0.51, Bust circumference of 0.52, underbust circumference of 0.46, and waist circumference of 0.42.

3. Analysis of inter relations between upper body measurements

1) Inter relations between categories of each upper body measurement parts<Table 9>

(1) height categories

The corelation coefficient between height categories showed high relevance of r=.92 or above, only the length between shoulder side, nipple, and waist line(r=.50), and the neck shoulder point to bust point to waist length(r=.47) showed mid-range relevance, and the remaining parts categories showed low relevance.

(2) width categories

The corelation coefficient between width categories showed relatively high relevance of r=.52 or above. Looking into corelation coefficient of depth categories, mostly showed mid-range relevance such as chest depth(r=.36), bust depth(r=.49), and the circumference category shows relatively high relevance such as chest circumference(r=.68), and bust circumference (r=.57), the highest relevance with width category was waist circumference and bust circumference. Length category showing the nipple length(r=.48 or above) shows mid-range relevance, and among detail categories related to breast, only bust external side length(r=.39) shows mid-range relevance, and the remaining measurements showed relatively low corelation coefficients.

(3) depth categories

The corelation coefficient between depth categories showed a high relevance of r=.62 or above. Looking at the corelation coefficient with circumference category, all of the categories including chest circumference(r=.63) and bust circumference(r=.58) showed the highest relevance, and the categories with the lowest relevance with depth category were bust circumference and waist circumference.

Neck shoulder point to bust point length(r=.42) and bust point to bust point length(r=.42), which are length categories, have mid-range relevance, and weight(r=.63) shows high relevance, and showed low relevance with the remaining measurement categories.

(4) circumference categories

The corelation coefficient between circumference categories shows high relevance of r=.81 or above, weight(r=.82) also shows high relevance, and especially it shows the highest relevance (r=.88) between waist circumference and underbust circumference.

The corelation coefficient with length category shows mid-range relevance as of neck shoulder point to bust point length(r=.58), shoulder center point to bust point length(r=.54), and lateral shoulder to bust point length(r=.48), and among the detail categories related to breast, bust point to bust point length(r=.44), bust external side length(r=.54), bust upper side length(r=.41), bust inner side length and bust under side slope degree(r=.40) shows mid-range relevance.

(5) Length categories

Circumference category was found to have relatively low relevance with other categories. Length category showed high relevance with width, depth, and circumference category, and low relevance with height category. Among detail categories related to breasts, it showed high relevance with bust upper side diameter(r=.77), bust upper side length(r=.82), bust depth(r=.55), and bust under side slope degree(r=.53), and showed mid-range relevance with bust point to bust point length(r=.45) and bust underside length(r=.47). It showed more than mid-range relevance with weight(r=.69), and it had little or very low relevance with other categories.

(6) The corelation coefficient between detail categories related to breasts and other categories

The corelation coefficient between detail categories related to breasts and other categories was found irregular for each part, which shows the highest relevance between bust upper side length and bust upper side diameter(r=.94) and relatively high relevances between bust inner side length and bust inner side diameter(r=.79), bust underside length 2 and bust underside length 1(r=.78), bust underside length 1and bust external length(r=.76), bust under side length 1 and Bust inner Side length(r=.71), bust upper side length and bust external side length(r=.69), bust external side length and bust inner side length(r=.68), chest length and bust external side length(r=.67), bust under side length 1 and bust inner side diameter(r=.66), bust under side length 2 and bust upper side length(r=.62), chest depth and bust under side length 1(r=.61), bust under side slope degree and bust upper side length(r=.61), and bust inner side slope degree and chest depth(r=.61). Bust external side length and bust external side diameter (r=.57), bust upper side length and bust inner side diameter(r=.57), bust under side slope

degree and bust upper side diameter(r=.57), bust external side length and bust inner side diameter(r=.56), chest length and bust upper side length(r=.56), chest length and bust inner side length(r=.54), bust under side length 1 and bust upper side length(r=.51), bust under side slope degree and chest depth(r=.51), and bust under side length 1 and inner side diameter(r=.50) showed mid-range relevance, and showed little or no relevance between other categories.

2) Relevance coefficients between categories of major parts

The corelation between major 7 categories used in brassiere dimension settings and original form production are as follows.

(1) underbust circumference

underbust circumference is a basic part category used in existing brassiere dimension setting and brassiere production, and the width, depth, circumference categories show high relevance with weight category, therefore if underbust circumference gets larger, chest circumference, bust circumference also get larger and it means high fatness in chest part. Among length categories, length between neck side and nipple, shoulder center point to bust point length shows mid-range relevance of r=.51 or above, and among categories related to breasts, bust external side length(r=.52) and bust point to bust point length(r=.50) showed mid-range relevance.

(2) Bust circumference - underbust circumference (cup size)

Bust circumference - underbust circumference means cup size, and along with Bust circumference - underbust circumference, combined as basic category of brassiere dimension standard, and generally has body shape information indicating breast volume. circumference means cup dimension, and along with underbust circumference, combined as basic category of brassiere dimension standard, and generally has body shape information indicating breast volume. It shows the highest relevance with bust external side length(r=.75) and relatively high relevance with breast lower part length1(r=.72), chest depth(r=.72), bust circumference(r=.69), bust inner side length (r=.66), bust depth(r=.64), and bust upper side length(r=.63). It showed mid-range relevance with neck shoulder point to bust point length(r=.59), shoulder center point to bust point length(r=.58), bust under side length2 (r=.58), bust upper side slope degree(r=.53), and bust under side slope degree(r=.51), and low relevance with other categories. That is, it shows that volume of breast and various breast shapes are related to many categories, and cannot be described simply by cup dimensions.

(3) bust point to bust point length

Looking at the corelation between bust point to bust point length and other categories, it showed mid-range relevance with width, depth, circumference, and length categories, and high relevance with bust inner side diameter(r=.75) and bust inner side length(r=.72). bust external side length(r=.52), bust upper side length(r=.46), bust under side length 1(r=.56), bust under side length 2(r=.40), bust external side slope degree (r=.44), and weight(r=.55) showed mid-range relevances.

(4) Bust inner side length and bust external side length

Bust inner side length and bust external side

length have high relevance with bust depth(r=.62 or above), neck shoulder point to bust point length(r=.53 or above), bust point to bust point length(r=.52 or above), bust inner side diameter (r=.56 or above), bust upper side length(r=.57 or above), bust under side length(r=.71 or above), bust under side length 2(r=.51 or above), and bust depth (r=.54 or above), and have mid range of relevance with bust width(r=.45 or above), waist width(r=.40 or above), chest circumference (r=.40 or above), bust upper side diameter(r=.46 or above), bust under outline length(r=.41 or above), bust upper side slope degree(r=.42 or above), and bust under side slope degree(r=.49 or above).

(5) Bust under side length and bust under outline length

Bust under side length showed a high relevance with bust inner side diameter(r=.66), bust inner side length(r=.71), bust external side length(r=.76), bust depth(r=.60), and bust under outline length(r=.60), and mid-range relevance with neck shoulder point to bust point length (r=.47), shoulder center point to bust point length (r=.46), bust point to bust point length (r=.56), and bust width(r=.46). The bust under outline length showed less than mid-range relevance with bust inner side diameter(r=.50), bust under side diameter(r=.46), bust under outline length(r=.42), bust inner side length (r=.41), and bust under side length 1(r=.40), and showed almost no relevance with the remaining categories.

As a result of the above analysis on the relevances, all of bust under outline length, chest circumference, bust inner side length, bust external side length, and bust under side length are found to have mid-range relevance with other categories. But bust under outline and chest circumference showed high relevances with width, depth, circumference and weight categories. The current dimensions of brassieres are composed of basic parts, underbust circumference and cup dimension, and these two have little relevance, so we could prove that it is reasonable to separate these two categories and select them as the basic parts of dimension standards. Therefore, this study suggests that, to suggest the dimension standard of brassieres for Chinese women of lower 20's, we should select the outline length of lower side of breast and cup dimension as the basic parts, and try to suggest the standard with reference to the related parts for brassiere manufacturing.

Ⅳ. Conclusion

This study was carried out with direct measurements of women in lower 20's living in Shanghai area and suggested the characteristics of breast and body for the purpose of providing fundamental informations need for the development of brassiere products that fit well to Chinese female adults.

1. From a result of analysis on the body measures to understand the characteristics of the shape of the breast of the Chinese female college students(18～24 years old), the height was related to the location of the bust as a vertical item. If a subject is tall, the subject has her bust at an upper area and if a subject is short, the subject has her bust at a lower area. And for the width and depth items related to the obesity and evenness of the trunk, both items showed a significant difference among the groups of 18～20, 21～22 and 23～24 years old and the group of 18～20 years old showed bigger width and depth than other groups. For the circumference that shows the obesity and volume

<Table 9> Relevance coefficient between body measurements

measurement items		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Height	1. Staus	1.00																																										
	2. Chest Height	.94	1.00																																									
	3. Bust Height	.92	.93	1.00																																								
	4. Underbust Height	.93	.94	.97	1.00																																							
Width	5. Chest Width	.40	.44	.37	.40	1.00																																						
	6. Bust Width	.10	.14	.03	.06	.65	1.00																																					
	7. Underbust Width	.05	.08	-.01	.05	.58	.85	1.00																																				
	8. Waist Width	.06	.10	.01	.05	.52	.75	.80	1.00																																			
Depth	9. Chest Depth	.17	.18	.12	.17	.36	.48	.51	.58	1.00																																			
	10. Bust Depth	.06	.15	.00	.03	.49	.69	.67	.71	.65	1																																	
	11. Underbust Depth	.12	.19	.09	.13	.43	.58	.59	.62	.73	.769	1																																
	12. Waist Depth	.01	.06	-.05	-.01	.49	.68	.72	.77	.62	.74	.75	1																															
Circumferenc e	13. Chest Circumference	.20	.24	.13	.19	.68	.77	.77	.74	.63	.77	.67	.74	1.00																														
	14. Bust Circumference	.10	.17	.01	.05	.57	.82	.77	.77	.58	.92	.71	.76	.85	1.00																													
	15. Underbust Circumference	.14	.20	.10	.14	.59	.78	.82	.82	.64	.79	.77	.81	.84	.86	1.00																												
	16. Waist Circumference	.07	.12	.00	.04	.55	.75	.80	.93	.62	.78	.71	.89	.81	.83	.88	1.00																											
Length	17. Neck Shoulder point to Bust point Length	.24	.27	.01	.11	.48	.56	.50	.52	.42	.67	.45	.52	.58	.70	.53	.57	1.00																										
	18.Neck Shoulder Point to Bust Point to Waist Length	.47	.51	.42	.43	.44	.33	.25	.27	.26	.38	.34	.18	.32	.39	.31	.23	.51	1.00																									
	19. Shoulder Center Point to Bust Point Length	.20	.24	-.02	.07	.48	.57	.50	.48	.34	.66	.41	.49	.54	.68	.51	.54	.95	.51	1.00																								
	20. Lateral Shoulder to Bust Point Length	.25	.29	.04	.13	.47	.50	.44	.41	.23	.55	.31	.42	.48	.58	.43	.47	.87	.48	.94	1.00																							
	21. Lateral Shoulder to Bust Point to Waist Length	.50	.56	.46	.48	.50	.35	.27	.27	.18	.34	.28	.18	.30	.37	.32	.23	.44	.81	.51	.57	1.00																						

<Table 9> continue

measurement items		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Relation of Bust	22. Bust point to Bust point Length	.22	.29	.15	.15	.26	.45	.33	.43	.42	.60	.55	.38	.44	.63	.50	.47	.45	.30	.39	.29	.33	1.00																						
	23. Bust inner side Point to Bust inner side Point Length	.12	.09	.04	.13	.12	.07	.15	.02	.21	.02	.23	.10	.10	.03	.14	.06	.16	.01	.15	.15	.06	.17	1.00																					
	24. Side Line-Bust External Point Length	.07	.07	.05	.09	.31	.16	.23	.12	.14	.18	.19	.20	.27	.17	.26	.18	.15	.13	.19	.20	.18	-.12	.12	1.00																				
	25. Bust Inner side Diameter	.09	.16	.06	.01	.11	.36	.18	.30	.28	.53	.36	.25	.27	.51	.30	.31	.32	.27	.28	.15	.21	.75	-.32	-.19	1.00																			
	26.Bust External side Diameter	-.0	.01	-.0	-.0	.28	.34	.39	.42	.07	.34	.08	.38	.32	.39	.35	.42	.28	.19	.27	.24	.15	.05	-.23	.03	.12	1.00																			
	27. Bust Upper side Diameter	.09	.18	-.1	-.0	.32	.39	.33	.32	.13	.53	.28	.38	.37	.52	.34	.39	.77	.34	.81	.75	.34	.35	.03	.12	.33	.23	1.00																		
	28. Bust Under side Diameter	.08	.11	.20	.03	-.0	.03	-.11	.01	-.08	.02	-.0	-.0	-.1	.04	-.0	-.04	-.1	.13	-.18	-.1	.15	.15	-.37	-.28	.34	.15	-.19	1.00																	
	29. Bust Inner side Length	.08	.12	-.0	-.0	.21	.45	.31	.40	.29	.62	.34	.32	.40	.63	.39	.41	.53	.31	.49	.37	.25	.72	-.24	-.11	.79	.15	.46	.16	1.00																
	30. Bust External side Length	.01	.07	-.0	-.0	.39	.66	.51	.56	.33	.76	.45	.52	.54	.78	.52	.58	.67	.36	.67	.57	.29	.52	-.16	-.17	.56	.42	.57	.15	.68	1.0															
	31. Bust Upper side Length	.09	.18	-.1	-.0	.33	.46	.36	.37	.16	.61	.32	.40	.41	.61	.38	.45	.82	.38	.85	.79	.37	.46	.01	.08	.41	.24	.94	-.12	.57	.69	1.0														
	32. Bust Under side Length 1	.03	.08	-.0	-.0	.21	.46	.27	.31	.22	.60	.34	.31	.31	.60	.30	.35	.47	.38	.46	.37	.32	.56	-.20	-.12	.66	.19	.36	.39	.71	.76	.51	1.0													
	33. Bust Under side Length 2	-.0	.01	-.0	-.1	.20	.40	.22	.31	.18	.48	.27	.26	.28	.49	.26	.32	.32	.30	.32	.26	.27	.40	-.22	-.10	.50	.22	.21	.40	.51	.62	.33	.78	1.0												
	37. Bust Under Outline Length	.14	.21	.19	.07	.16	.33	.15	.30	.15	.32	.27	.22	.21	.37	.28	.30	.10	.24	.07	.02	.23	.42	-.44	-.31	.62	.23	.08	.63	.48	.51	.18	.55	.47	1.0											
	35. Bust Depth	-.0	-.0	-.1	-.1	.27	.47	.39	.28	.03	.51	.13	.23	.32	.54	.23	.27	.55	.26	.57	.51	.22	.21	-.18	.08	.32	.22	.48	-.06	.54	.67	.56	.61	.49	.07	1										
	36. Bust Upper side Slope	-.1	-.0	-.1	-.1	.08	.30	.22	.28	.02	.46	.14	.24	.21	.49	.29	.28	.22	.08	.23	.15	.10	.39	-.18	-.02	.43	.35	.18	.31	.42	.50	.29	.43	.40	.33	.39	1									
	37. Bust Under side Slope	-.1	-.0	-.2	-.1	.19	.37	.36	.30	.25	.58	.33	.33	.40	.52	.33	.35	.53	.17	.53	.47	.12	.37	.11	.12	.32	.06	.57	-.31	.49	.50	.61	.32	.22	-.1	.51	.28	1.0							
	38. Bust Inner side Slope	-.0	-.0	-.1	-.0	.24	.33	.28	.15	-.07	.26	.05	.13	.20	.28	.13	.14	.29	.17	.33	.32	.15	-.03	-.02	.12	-.03	.05	.22	-.07	.10	.38	.29	.29	.27	-.0	.61	.28	.33	1.00						
	39. Bust External side Slope	.14	.21	.12	.11	-.1	-.05	-.14	-.11	.12	.17	.28	-.0	-.0	.10	-.0	-.07	.13	.06	.10	.05	.10	.44	.18	-.04	.34	-.43	.19	.00	.26	.08	.23	.19	.06	.14	.03	.08	.29	-.02	1.00					
The Others	40. Weight	.44	.48	.33	.38	.68	.72	.70	.75	.63	.77	.72	.75	.82	.81	.82	.83	.69	.44	.65	.58	.44	.55	.15	.23	.36	.29	.47	-.05	.44	.56	.52	.37	.28	.28	.29	.22	.35	.17	.12	1.00				
	41. Bust Circumference-Waist Circumference	.07	.11	.03	.02	.14	.28	.13	-.09	.06	.42	.16	-.0	.24	.48	.15	-.09	.35	.34	.37	.29	.29	.40	-.04	.02	.42	.03	.32	.13	.49	.48	.39	.53	.38	.19	.54	.43	.37	.29	.29	.15	1.00			
	42. Chest Circumference-Underbust Circumference	-.0	.03	-.1	-.1	.25	.47	.31	.30	.20	.64	.27	.29	.42	.69	.23	.34	.59	.30	.58	.49	.25	.50	-.15	-.04	.56	.24	.52	.15	.66	.75	.63	.72	.58	.31	.72	.53	.51	.36	.20	.39	.70	1.00		
	43. Chest Circumference-Bust Circumference	.12	.06	.18	.20	-.0	-.36	-.27	-.32	-.13	-.5	-.3	-.2	-.0	-.5	-.3	-.33	-.4	-.24	-.45	-.3	-.2	-.52	.10	.09	-.54	-.24	-.42	-.24	-.58	-.6	-.5	-.6	-.4	-.3	-.5	-.59	-.3	-.23	-.22	-.28	-.53	-.64	1.00	
	44. Index of Rohrer	-.4	-.3	-.4	-.4	.35	.65	.66	.70	.49	.72	.61	.75	.65	.74	.71	.78	.48	.04	.48	.37	.01	.36	.04	.17	.28	.32	.39	-.10	.38	.56	.45	.35	.29	.16	.34	.36	.44	.25	-.02	.62	.09	.41	-.39	1.00

of the bust area, the bust circumference was 83.86cm and the underbust circumference was 73.37cm and the cup size of a brassiere was 75A. From a result of analysis on the detailed items related to the bust that show the degrees of being broad and drooped, area of the lower bust, volume and protrusion, the bust point-bust point was shorter as much as a woman was younger. The bust point-bust point becomes shorter than the adolescent period if growth completes and it becomes longer as the bust point-bust point becomes broader according to aging.

2. From a result of analysis on the bust measures to understand the relations between the front, lateral and cross-sectional proportions of the bust and the shape of the breast in the Chinese women in their early 20s, the chest height was 0.77, the bust height was 0.71 and the underbust height was 0.68 as the information of the body type that shows the location of the bust that is the measure of an item to a height as the front proportion of the bust. For the lateral proportion of the bust, the chest depth of the waist depth was 0.98, the bust depth, 1.21 and the underbust depth, 1.03. While the bust depth/waist depth is ideal when being 1.3, it was 1.21 in this study to be close to the ideal lateral shape. For the cross-sectional proportion of the bust, the area of the largest evenness was the bust followed by the waist, underbust and chest in order. The difference between the waist and the underbust circumference in the cross section was not great to have a flat shape.

3. From a result of analysis on the correlation between measured items necessary to understand the characteristic of the shape of the breast, to set up the sizes and to produce the patterns, the underbust circumference had a relatively high correlation between the items of breadth, depth and circumference and weight as the items of basic areas. It is considered that if the underbust circumference becomes larger, obesity is high as the chest and bust circumferences increase. The bust circumference -underbust circumference means the cup size, is combined as a basic item for the brassiere sizes together with the underbust circumference and contains the information of a body type that show the volume of the breast.

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