

## Comparative Analysis of Korean and American Body Sizes & Shapes using 3D Scanned Anthropometric Data

Kyong-Hwa Yi<sup>†</sup> · Cynthia Istook\* · Yeosun Kang\*\* · Hei-Sun Choi\*\*\*

Dept. of Clothing & Textiles, The Catholic University of Korea

\*Dept. of TATM, College of Textiles, North Carolina State University

\*\*Dept. of Fashion Design, Duksung Women's University

\*\*\*Dept. of Clothing & Textiles, Ewha Womans University

### 한국과 미국 성인의 3차원 인체 치수 비교

이경화<sup>†</sup> · Cynthia Istook\* · 강여선\*\* · 최혜선\*\*\*

가톨릭대학교 의류학전공, \*Dept. of TATM, College of Textiles, North Carolina State University

\*\*덕성여자대학교 의상디자인전공, \*\*\*이화여자대학교 의류직물학과

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#### Abstract

This research is the initial step for establishing a convertible body sizing table applicable to the Korean and American female apparel industry. All 3D female measurement data of the two countries were obtained from Size Korea Project and SizeUSA Project. The sample subjects used in this study were 1,988 Korean and 6,306 American females. Thirty-four(34) variables were chosen as the principal measurements in making garments. The conclusion of this research was as follow:

First, it was determined that American women were larger and longer than Korean women in all measurement except shoulder slope measurement.

Second, according to the differences analysis of the each age group in Korean Females, all measurements except hip girth had significant differences among the age groups. In case of American females, all measurements except arm length(shoulder to wrist) had significant differences among the age groups.

Third, in the comparison of differences between the age groups of the two countries' women, some dimensions varied significantly with age, while others did not show any statistical significance among the age groups.

Fourth, according to the t-tests of same age groups between Korean & American female measurements, American female measurements were larger and longer than Korean in all measurements except crotch length total, shoulder slope, hip girth-bust girth and hip girth-waist girth.

**Key words:** 3D body scanning, Anthropometric, Body measurements; 인체 스캔, 인체 측정, 인체 치수

<sup>†</sup>Corresponding author

E-mail: ykh@catholic.ac.kr

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## I. Introduction

Laser scanning systems have the advantage of speed in comparison to measurement methods using measuring tapes and calipers (Istook & Hwang, 2001). These data obtained from 3D scanners are used in many ways, especially these are applicable to establish sizing tables for garment (ASTM, 2006a, 2006b; ISO, 2006a, 2006b, 2006c; KATS, 2004b, 2004c).

Currently, Korea is a major importer of U.S. apparel products, and apparel trade between America and Korea has increased significantly and rapidly since many trade barriers have been eliminated (Apparel News, 2003).

Between 2003~2004, Korea successfully finished a nationwide project called "Size Korea" to establish a database of Korean people body sizes (KATS, 2004a). After Size Korea, an International comparative study of body sizes was completed in 2005. However, the information relating to the U.S. was insufficient because the data was limited due to lack of recent research data collected on body sizes.

In 2005, the Korean government regulated that imported apparel be properly labeled for size according to KS. Therefore, each apparel company has to label by KS apparel sizing format instead of the importing countries format. However, currently, most of the Korean apparel companies purchase foreign apparel products without information on body sizes from the importing countries.

The apparel industry and relevant university

researchers have utilized 3D body measurement data from the 2002 SizeUSA project, which collected American adult body measurements ([TC]<sup>2</sup>, 2004).

Three dimensionally (3D) scanned anthropometric measurement data of 1,988 Korean female adults from Size Korea and 6,306 American female adults from SizeUSA were analyzed in this study.

Statistical methods in the study were accomplished by (1) descriptive analysis and t-test between the two countries, (2) ANOVA by age groups of each country's subjects and Duncan's multiple range tests, (3) t-test of Korean/American body sizes by each age group.

Standardization of apparel sizing is important to the Korean apparel industry and this research will greatly expedite the completion of that objective.

## II. Methods

Demographic distribution of subjects by age groups and ethnic category were shown in <Table 1>. Measurements of 1,988 Korean and 6,306 American females over 18 years old were obtained from the 3D scanning. Korean female data were categorized into 6 age groups because SizeUSA data were fixed at 6 age groups.

Thirty four measurements were selected which were considered critical in making garments (Table 2). All measurements were taken according to same measuring techniques, however, some measurements had a different name between the two countries. In

Table 1. Demographic distribution of the subjects used

	Korean		American									
			White		Black		Hispanic		Others		Group Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
18~25	463	23.3	707	1.2	293	4.6	271	4.3	266	4.2	1537	24.4
26~35	518	26.1	653	10.4	290	4.6	233	3.7	271	4.3	1447	22.9
36~45	382	19.2	686	10.9	268	4.2	176	2.8	210	3.3	1340	21.2
46~55	272	13.7	682	10.8	194	3.1	106	1.7	159	2.5	1141	18.1
56~65	194	9.8	413	6.5	54	.9	44	.7	94	1.5	605	9.6
66~	159	8.0	187	3.0	6	.1	8	.1	35	.6	236	3.7
Total	1988	100.0	3328	52.8	1105	17.5	838	13.3	1035	16.4	6306	100.0

Table 2. Measurements and computed value used

	Measurements		Measurements	
Girths	1. Bust girth	Heights	18. Crotch height	
	2. Waist girth		19. Knee height	
	3. Hip girth		20. Ankle height	
	4. Mid Neck girth	Lengths	21. Waist length(Front)	
	5. Neck Base girth		22. Waist length(Back)	
	6. Armscye girth		23. Cross back width(Interscye fold, back)	
	7. Elbow girth		24. Cross chest width(Interscye fold, front)	
	8. Thigh, Max girth		25. Arm length(Shoulder to wrist)	
	9. Thigh, Mid girth		26. Arm length(Center back neck to wrist)	
	10. Knee girth		27. Bust point to bust point	
	11. Calf girth		28. Neck to bust point	
	12. Ankle girth		Others	29. Shoulder slope(degree)
	13. Total crotch length			30. Weight(Kg)
Heights	14. Height	Computed Values	C1. Hip girth-bust girth	
	15. Back neck point height		C2. Hip girth -waist girth	
	16. Waist height		C3. Bust girth -waist girth	
	17. Hip height		C4. BMI <sup>1</sup>	

<sup>1</sup>Body mass index (BMI) is a measure of body fat based on height and weight that applies to both adult men and women. The equation of BMI and interpretation of BMI categories are as below. **BMI Categories: Underweight=<18.5, Normal weight=18.5-24.9, Overweight=25-29.9, Obesity=BMI of 30 or greater**([http://www.nhlbi.nih.gov/guidelines/obesity/bmi\\_tbl.htm](http://www.nhlbi.nih.gov/guidelines/obesity/bmi_tbl.htm), Nov. 21st 2006).

Note. BMI=Weight(Kg)/Height(m<sup>2</sup>)

cases wherein there were differences between American and Korean measurement titles, American Measurement titles were chosen. For example, (1) cross back width(USA); interscye fold, back(Korea) (2) cross chest width(USA); interscye fold, front(Korea).

Statistical data were analyzed using SPSS 12.0.1 (2003). For analysis of body sizes, descriptive statistics were calculated, and t-tests were used to verify the differences in the two countries' female measurements and computed values. In analyzing body sizes between the age groups, one way Anova and Duncan multiple range tests were used. For comparing body sizes of the two countries, t-tests of each measurement by the age groups were also used.

### III. Results and Discussion

#### 1. Korean/American Comparison of Body Measurements

<Table 3> illustrates the comparison of the measurements between Korean and American females.

The values obtained for average and standard deviation, as well as important statistical information for the 34 anthropometric dimensions, and t-values were presented in this table.

The shaded variables mean which Korean measurements are bigger or larger than American women.

All measurements except "crotch length total" were different significantly between Americans and Koreans. In most of the dimensions, the averages of American females were higher than Korean females. All height measurement variables of American females were higher than those of Korean females. All girth measurements of American females were bigger than Korean females. In case of lengths measurements, American females' measurements were longer than Korean females' measurements. "shoulder slope(degrees)" of American females was smaller than Korean females.

Overall, the result indicates that US women have measurements that exceed Korean women, except for crotch length total and shoulder slope.

Table 3. American/Korean differences of the body sizes

(unit: cm, Kg, °)

Measurements	Korean				American				t-value
	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max	
Bust girth	89.88	9.45	69.40	120.00	103.67	12.85	71.03	161.23	44.12***
Waist girth	76.60	10.87	57.10	114.80	87.40	13.83	60.22	157.53	31.40***
Hip girth	93.01	9.02	77.80	118.80	109.61	12.75	81.52	181.18	54.33***
Mid-Neck girth	32.62	3.35	26.10	44.30	35.77	3.51	27.79	132.31	35.15***
Neck Base girth	37.55	3.62	30.00	58.00	38.32	3.21	29.81	130.94	7.86***
Armscye girth	35.14	3.73	26.30	51.10	42.27	5.11	24.55	128.14	57.64***
Elbow girth	23.16	2.19	17.20	30.30	26.39	3.20	17.75	62.08	41.88***
Thigh Max girth	55.24	5.65	39.60	77.10	62.52	7.49	43.48	100.42	39.73***
Thigh Mid girth	49.27	5.04	36.90	73.10	51.26	6.35	26.42	85.41	11.95***
Knee girth	35.04	3.40	26.70	51.30	39.06	3.80	25.55	67.04	42.37***
Calf girth	33.97	3.45	22.10	47.30	38.14	4.00	23.35	94.04	41.95***
Ankle girth	23.49	2.49	17.60	31.00	25.58	2.31	15.75	40.54	34.39***
Crotch length total	71.92	6.05	57.60	88.90	72.40	9.02	25.48	120.96	1.09 <sup>NS</sup>
Height	156.42	13.57	133.70	178.50	162.74	6.98	123.53	208.85	30.81***
Back neck point height	131.91	11.58	112.60	152.60	139.85	6.37	106.69	163.81	45.02***
Waist height	96.36	8.94	80.00	114.20	100.29	6.00	66.63	120.02	22.58***
Hip height	75.15	7.10	60.10	91.10	81.37	6.81	61.66	104.70	35.68***
Crotch height	69.59	6.66	57.80	86.50	73.42	4.77	51.13	98.24	28.85***
Knee height	39.97	3.75	30.40	48.20	44.31	3.04	20.11	56.71	55.78***
Ankle height	5.28	0.68	3.60	7.10	6.98	1.00	3.51	12.53	70.73***
Waist length front	32.27	2.91	24.40	39.90	37.57	4.23	19.33	74.65	52.33***
Waist length back	38.28	3.14	17.00	46.10	44.01	2.99	33.48	83.23	77.11***
Cross back width	35.22	3.18	27.80	45.70	36.75	3.72	24.44	57.55	15.86***
Cross chest width	33.66	3.08	27.00	42.30	37.75	4.94	16.17	81.34	34.49***
Arm length(Shoulder to wrist)	50.59	3.82	11.00	21.60	53.54	3.86	38.96	73.96	30.11***
Arm length(CBNeck to wrist)	71.13	5.13	19.70	35.40	72.64	4.47	57.15	94.14	11.79***
Bust point to bust point	15.56	1.69	40.50	59.20	21.04	2.41	2.10	31.98	95.14***
Neck to bust point	26.15	2.83	61.60	81.40	27.97	3.03	18.94	45.89	23.29***
<b>Shoulder slope(degrees)</b>	<b>24.68</b>	<b>4.12</b>	<b>12.00</b>	<b>36.00</b>	<b>21.22</b>	<b>3.75</b>	<b>7.49</b>	<b>36.30</b>	<b>-34.95***</b>
Weight(Kg)	56.32	7.88	35.5	96.0	70.57	17.43	13.15	179.13	35.30***
Hip girth-Bust girth	3.14	11.19	-2.30	25.10	5.94	6.55	-19.01	34.09	13.73***
Hip girth-Waist girth	16.41	12.22	-11.20	33.00	22.21	6.06	-3.06	46.23	28.15***
Bust girth-Waist girth	13.33	4.01	-14.60	19.50	16.27	4.85	-7.13	36.28	24.40***
BMI	23.00	.30	.15	.39	.27.00	.60	0.05	0.70	26.46***

\*\*\* $p < .001$ , \* $p < .05$ , NS: no significance

## 2. Korean/American Comparison of Body Sizes by Age Groups

Subject samples used in this study encompass the different age groups.

Korean female data were categorized into 6 age

groups because SizeUSA data were fixed at 6 age groups.

<Table 4> shows the differences of the each age group in Korean Females. All measurements except hip girth had significant differences among the age groups.

Table 4. Analysis of body size in Korean females by age groups

	18~25		26~35		36~45		46~55		56~65		66~		F-value
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Bust girth	85.6	5.9	88.1	7.2	90.5	7.0	94.0	7.3	95.4	7.5	96.5	7.6	113.665***
Waist girth	69.9	6.3	73.2	8.2	77.0	7.6	81.9	8.4	85.4	8.9	89.2	8.6	243.230***
Hip girth	93.3	5.2	93.5	5.9	94.1	5.3	93.6	5.5	93.0	5.3	93.7	5.7	1.352*NS
Mid-Neck girth	31.5	2.1	32.3	2.5	33.0	2.5	33.0	3.1	33.8	2.7	35.2	2.6	62.750***
Neck Base girth	36.8	2.6	37.6	2.8	38.0	2.7	37.7	3.2	37.8	2.7	39.4	2.7	21.500***
Armscye girth	33.9	2.6	34.9	3.1	35.6	2.9	35.9	3.1	36.2	3.2	37.2	3.1	40.950***
Elbow girth	22.6	1.9	23.1	1.9	23.4	2.1	23.1	2.7	23.2	2.4	24.4	2.3	18.886***
Thigh Max girth	55.7	4.5	55.6	4.7	55.8	4.3	55.3	5.0	54.3	4.7	54.7	4.6	4.111***
Thigh Mid girth	49.6	4.2	49.7	4.5	49.8	3.8	49.3	3.9	48.0	4.0	48.2	3.9	6.150***
Knee girth	35.7	2.5	35.4	2.6	35.1	2.5	34.3	3.0	34.3	3.0	35.4	2.8	13.934***
Calf girth	34.6	2.6	34.5	2.7	34.4	2.5	33.4	3.1	32.9	2.9	33.3	2.8	20.731***
Ankle girth	23.5	1.9	23.6	1.8	23.7	1.9	23.3	2.6	23.2	2.3	24.3	2.3	7.797***
Crotch length total	160.3	5.2	159.1	5.9	157.5	5.0	154.9	5.2	152.9	5.0	151.3	5.5	117.737***
Height	135.1	4.8	134.1	5.4	132.8	4.7	130.8	4.8	129.1	4.6	127.8	4.9	90.393***
Back neck point height	100.0	4.1	98.3	4.6	96.6	4.0	94.6	4.1	93.2	4.0	92.4	4.1	141.938***
Waist height	78.2	3.5	76.5	3.9	75.2	3.3	73.8	3.3	72.6	3.3	72.5	3.6	121.425***
Hip height	72.5	3.4	70.9	3.8	69.8	3.1	68.4	3.2	67.2	3.1	66.4	3.3	129.939***
Crotch height	41.2	2.0	40.6	2.1	40.0	1.9	39.6	1.8	39.1	1.8	38.8	1.9	65.529***
Knee height	5.4	0.6	5.3	0.6	5.3	0.6	5.3	0.5	5.3	0.5	5.2	0.5	4.364***
Ankle height	31.8	1.9	32.3	2.2	32.6	2.2	33.0	2.1	33.2	2.3	32.2	2.6	18.657***
Waist length front	37.6	2.0	38.3	2.2	38.7	2.2	39.1	2.0	39.1	2.2	38.3	2.5	21.892***
Waist length back	34.2	2.1	35.0	2.3	35.8	2.2	36.2	2.3	36.5	2.2	36.1	2.6	49.419***
Cross back width	33.4	2.1	33.9	2.3	33.9	2.1	33.9	2.3	34.0	2.1	34.1	2.5	5.124***
Cross chest width	51.6	2.3	50.9	2.6	50.3	2.3	50.2	2.2	50.2	2.2	50.5	2.2	20.921***
Arm length(Shoulder to wrist)	72.3	2.8	71.5	3.2	70.9	2.8	70.7	2.8	70.8	2.9	70.8	2.8	17.100***
Arm length(CBNeck to wrist)	15.5	1.3	15.6	1.5	15.6	1.4	15.7	1.4	15.9	1.6	15.5	1.6	2.693*
Bust point to bust point	25.0	1.8	25.4	2.2	26.3	2.1	27.4	2.3	27.8	2.3	28.5	2.3	118.536***
Neck to bust point	72.6	4.1	72.7	4.0	72.5	4.3	71.4	4.5	70.7	4.6	71.2	4.6	10.854***
Shoulder slope(degrees)	25.6	4.1	24.5	3.7	24.3	3.8	24.8	3.7	25.0	3.9	23.9	3.8	7.665***
Weight(Kg)	54.1	7.5	55.4	8.4	57.0	7.4	58.2	7.9	58.1	7.7	57.8	8.2	15.326***
Hip girth-Bust girth	7.70	2.9	5.4	3.2	3.59	3.10	-0.39	3.3	-2.4	3.4	-2.7	3.6	247.42***
Hip girth-Waist girth	23.4	3.8	20.2	4.9	17.0	5.3	11.7	6.0	7.61	6.7	4.6	5.9	535.76***
Bust girth-Waist girth	15.7	3.8	14.8	4.4	13.4	5.0	12.1	5.3	10.0	5.3	7.3	4.9	238.07***
BMI	21.0	2.7	21.9	3.0	23.0	2.7	24.2	2.9	24.8	2.8	25.2	3.08	101.095***

Results obtained regarding the Anova test among the age groups in Korean females indicate that 32 measurements are significant at 1% level, only 1 measurement is significant at 5% level, and the remaining 1 measurement being non-significant.

<Table 5> shows the differences of the each age

group in American females. All measurements except arm length(shoulder to wrist) had significant differences among the age groups.

According to the Anova test among the age groups in American females, 33 measurements out of 34 measurements are significant at 1% level.

**Table 5. Analysis of body size in American females by age groups**

Measurements	18-25		26-35		36-45		46-55		55-65		66~		F value
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Bust girth	98.4	11.7	103.2	13.3	105.8	12.9	107.0	12.8	107.1	11.2	104.5	10.7	90.37***
Waist girth	81.6	12.0	86.5	14.0	89.1	14.0	91.2	14.1	92.1	12.4	91.5	12.5	101.68***
Hip girth	104.7	11.2	109.6	12.9	111.6	13.2	112.3	13.0	112.5	11.4	111.2	11.8	73.13***
Mid-Neck girth	34.3	4.1	35.5	4.4	36.4	3.6	36.7	3.6	37.1	3.3	37.2	3.5	82.48***
Neck Base girth	37.0	3.6	38.1	3.2	38.9	3.3	39.1	3.2	39.5	3.1	39.5	3.3	92.91***
Armseye girth	40.1	4.4	41.8	5.0	43.0	5.6	43.5	4.9	44.4	4.9	44.9	5.8	114.38***
Elbow girth	25.2	2.9	26.2	3.2	26.9	3.5	27.1	3.2	27.2	2.7	26.9	3.3	73.63***
Thigh Max girth	61.0	7.3	63.5	7.9	64.0	7.9	62.9	7.0	61.5	6.2	59.3	6.4	40.47***
Thigh Mid girth	50.3	6.1	52.1	6.7	52.3	6.7	51.5	6.0	50.3	5.5	48.3	5.6	34.09***
Knee girth	38.2	3.5	39.0	3.8	39.4	4.0	39.5	3.8	39.6	3.7	39.2	3.9	24.22***
Calf girth	37.2	3.7	38.4	4.1	38.9	4.4	38.5	3.8	38.0	3.5	37.3	3.9	30.61***
Ankle girth	25.2	2.0	25.4	2.2	25.8	2.5	25.9	2.4	26.0	2.5	25.9	2.7	22.14***
Crotch length total	70.1	9.0	71.9	9.2	73.2	9.2	73.5	8.7	74.3	7.5	75.0	8.7	36.09***
Height	163.1	7.1	163.3	7.1	163.1	7.3	162.6	6.9	161.5	7.4	160.0	6.8	13.43***
Back neck point height	139.9	6.4	140.2	6.3	140.2	6.4	139.9	6.3	138.7	6.6	137.6	6.4	11.21***
Waist height	100.6	6.2	100.4	6.0	100.3	6.0	100.0	5.9	99.5	5.8	99.8	6.0	3.96***
Hip height	79.0	5.8	80.4	6.3	81.5	6.9	83.1	7.2	84.3	6.5	85.9	7.0	109.51***
Crotch height	74.5	4.8	73.8	4.7	73.3	4.7	72.8	4.7	71.9	4.8	71.6	4.6	40.16***
Knee height	44.5	2.9	44.4	3.0	44.2	3.1	44.3	3.1	44.0	3.4	43.7	3.4	4.92***
Ankle height	7.1	0.9	7.0	1.0	7.0	1.1	6.9	1.0	6.9	1.0	6.7	1.0	10.29***
Waist length front	36.5	4.0	37.8	4.2	38.1	4.0	38.5	4.4	37.8	4.4	35.6	4.5	50.51***
Waist length back	43.7	3.2	44.0	3.1	44.3	2.8	44.4	3.0	44.0	2.9	43.1	3.0	12.75***
Cross back width	35.3	3.4	36.7	3.8	37.5	3.7	37.7	3.7	37.3	3.6	36.6	3.5	74.01***
Cross chest width	36.7	4.7	37.9	4.9	38.4	4.7	38.5	4.9	37.9	5.3	35.6	5.7	33.28***
Arm length(Shoulder to wrist)	53.7	3.8	53.5	3.8	53.4	3.8	53.6	3.9	53.5	4.1	53.7	3.9	1.13 <sup>NS</sup>
Arm length(CBNeck to wrist)	72.1	4.4	72.6	4.4	72.8	4.4	73.2	4.6	72.8	4.6	72.3	4.5	8.99***
Bust point to bust point	20.4	2.2	21.0	2.5	21.3	2.4	21.4	2.5	21.5	2.3	20.8	2.4	36.83***
Neck to bust point	26.5	2.8	27.9	3.0	28.4	3.0	28.8	3.0	29.1	2.6	28.8	2.8	127.57***
Shoulder slope(degrees)	20.8	3.8	20.7	3.7	21.2	3.7	21.7	3.7	22.2	3.7	22.4	4.0	26.81***
Weight(Kg)	64.7	15.9	70.8	18.3	73.6	18.4	73.9	17.4	72.5	14.6	69.3	14.3	55.08***
Hip girth-Bust girth	6.3	5.8	6.4	6.5	5.7	7.0	5.3	6.9	5.4	7.0	6.8	6.1	6.94***
Hip girth-Waist girth	23.1	5.5	23.1	5.9	22.5	6.3	21.0	6.1	20.4	6.3	19.7	6.3	41.76***
Bust girth-Waist girth	16.8	4.7	16.7	4.7	16.8	4.7	15.8	5.0	15.1	5.0	12.9	4.9	41.70***
BMI	24.3	5.6	26.6	6.5	27.6	6.5	27.9	6.1	27.9	5.3	27.0	5.3	68.30***

<Table 6> illustrates the result of Duncan multiple range tests obtained for six different anthropometric dimensions according to the defined age groups. In this table, all variables were categorized into three groups: 1) increase with age, 2) decrease with age, 3) no relation with age.

This shows that, while some dimension vary significantly with age, other do not show any particular trend in the two countries. All measurements except arm length(shoulder to wrist) of American women, showed the significant difference between age groups. Height Measurements decreased significantly with

Table 6. Korean/American comparison by Duncan multiple range tests

Measurements	Korea			U.S.		
	Increase with Age	Decrease with Age	No relation with age	Increase with Age	Decrease with Age	No relation with age
Bust girth	***					***
Waist girth	***			***		
Hip girth			*			***
Mid-Neck girth	***			***		
Neck Base girth	***			***		
Armscye girth	***			***		
Elbow girth			***	***		
Thigh Max girth						***
Thigh Mid girth		***				***
Knee girth			***			***
Calf girth		***				***
Ankle girth			***			***
Crotch length total			***		***	
Height		***			***	
Back neck point height		***			***	
Waist height		***			***	
Hip height		***				***
Crotch height		***			***	
Knee height		***			***	
Ankle height		*			***	
Waist length front			***			***
Waist length back			***			***
Cross back width			***			***
Cross chest width			*			***
Arm length(Shoulder to wrist)			***	NS		
Arm length(CBNeck to wrist)		***				***
Bust point to bust point			***			***
Neck to bust point	***			***		
Shoulder slope(degrees)			***	***		
Weight(Kg)			***			***
Hip girth-Bust girth		***				***
Hip girth-Waist girth		***			***	
Bust girth-Waist girth		***			***	
BMI	***					***

\*\*\* $p < .001$ , \* $p < .05$ , NS: no significance

age in the two study groups. Girth measurements like waist, neck and armscye girths, increased significantly with age groups, while hip girth had no any relationship with age groups. Also, waist length front

and back, cross chest width, cross back width and weight also had no relationship with age groups.

In case of hip girth-waist girth, bust girth -waist girth values decrease significantly with age in the



two countries but hip girth -bust girth value of American females showed no relationship with age.

### 3. Korean/American Comparison of Body Sizes by Same Age Groups

<Table 7> illustrates the comparison of body sizes by same age groups between Korean and American.

Results obtained regarding the t-tests between the two countries' same age groups indicate that approximately 94% of the values obtained are significant at 1% level, approximately 2.5% of the values are significant at 5% level, and the remaining 3.9% being non-significant.

Girth and height measurements of American females were higher than Korean females. And width measurements of American females were bigger than those of Korean females. Except for "crotch length total" in (1) 18-25 age group and (2) 26-35 age group, American female measurements were longer than Korean females' measurements. Shoulder slope (degrees) of American females was smaller than Korean females in all age groups. In all computed values, except for hip girth-bust girth and hip girth-waist girth in 18~25 age group, American females' measurements were larger than Korean females' measurements.

In 18~25 aged group of the two countries, American females were significantly larger and longer than Korean females in all variable except crotch length total, shoulder slope, "hip girth-bust girth" and "hip girth-waist girth". However, neck base measurement showed no significance between the two groups. American females were significantly larger and longer than Korean females in all variables except crotch length total and shoulder slope in the 26-35 age group. In the 36-45 age group and higher groups, all American measurement except shoulder slope were statistically larger and longer than Koreans.

It was determined Korean women are smaller and shorter than American women in girths, lengths and heights. Korean women show more shoulder slope than Americans with in the same age groups.

In case of 65 and higher age group, neck base, thigh mid, cross back width and neck to bust point

measurement had no significance between the same age group in the two countries. Therefore, it could be determined that this result verifies similarity of body characteristics due to aging.

## IV. Conclusions

Thirty-four body measurements including computed values of Korean and American female adults were summarized in this study. This will be useful for the design and manufacturing of garments which will be imported and exported between the two countries.

First, It was determined that American female measurements such as heights, weight, lengths, circumferences and computed values were significantly larger and longer than Korean female measurements. However, Shoulder Slope of American female was smaller than that of Korean.

Second, the subjects were categorized into six age groups: 18~25, 26~35, 36~45, 46~55, 56~65, higher than 65. According to the differences analysis of the each age group in Korean Females, all measurements except hip girth had significant differences among the age groups. In case of American females, all measurements except arm length(shoulder to wrist) had significant differences among the age groups.

Third, there were no significant differences by age groups between the two countries' female measurements analysis. The analysis of Korean and American women established that waist and neck girths increased significantly with age but all height measurements decreased with in the same age groups.

Fourth, according to the t-tests of same age groups between Korean & American female measurements, Korean women are smaller and shorter than American women in girths, lengths, heights, and Korean women have more shoulder slope than Americans with in the same age groups.

This research will benefit domestic companies as a valuable informational tool in the planning and manufacture of apparels. The statistical information will also be a valuable database for the future research and current apparel sizing usage.

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## 요 약

본 연구는 한미 성인여성복의 산업계에서 상호적용이 가능한 신체 치수 호환표의 작성에 필요한 기초연구로, 본 연구에 사용된 인체 치수는 모두 3차원 스캐너를 통해 수집된 것이다. 분석대상인 한국인의 인체 치수는 Size Korea사업에 의해 수집된 1,988명의 인체 치수 자료이고, 미국인의 인체 치수는 SizeUSA사업에 의해 확보된 6,306명의 성인여성 인체 치수 자료이다. 의류제작에 관련이 높다고 사료되는 34개 측정항목이 분석에 사용되었으며, 연구결과는 다음과 같다.

첫째, 어깨경사각을 제외한 전체 측정항목에서 미국 여성이 한국 여성의 인체치수에 비해 그 값이 유의하게 큰 것으로 나타났다.

둘째, 연령집단간 각 측정항목의 평균치를 차이를 검증한 결과, 한국 여성의 경우 엉덩이둘레를 제외한 모든 측정항목에서 연령집단간 유의차가 검증되었으며, 미국 여성의 경우 팔길이를 제외한 모든 측정항목에서 연령집단간 유의차가 검증되었다.

셋째, 양국 여성의 연령집단간 차이를 비교 분석한 결과, 몇몇 측정치의 경우 연령집단에 따라 유의미한 차이를 보였으나, 대부분의 항목에서는 연령집단간 유의차를 나타내지 않았다.

넷째, 양국 성인여성의 동일 연령집단간 t-test결과, 살았뒤길이, 어깨경사각, 엉덩이둘레-뺨가슴둘레, 엉덩이둘레-허리둘레를 제외한 모든 항목에서 미국 성인여성 측정치가 한국 성인여성 측정치보다 유의하게 큰 것으로 나타났다.