

2007 WEAR Conference, Banff

Comparing Samples from Different Countries for Key sizing Dimensions

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Outline

Now, in view of the importance of e-shopping all over the world, and of the ever increasing worldwide travel and trade, online information tools seem to be increasingly necessary

In the context of these kinds of social and technical environmental changes, detailed online information tools about size and design data should be put at the disposal of both consumers and producers to help them choose the right garments and design the most suitable ones.

For this purpose, WEAR strives to construct databases with these concepts for size compatibility and market share information between countries.

Contents

Today, I introduce few solutions towards an <Online Size Information Tool> I am developing for the clothing market globalization using the following data:

- 1. Anthropometric Measurement Data Source**
- 2. Standards and Standard Organizations in Clothing**
- 3. Sizing Systems (KS, AFNOR, ISO, JIS, ASTM, NSZ)**
- 4. Distribution of the Key Dimensions**
- 5. Distribution of the 2ndary Key Dimensions**
- 6. Comparing Samples from Different Countries**
- 7. Applications**
- 8. Conclusions and Future Works**

Anthropometric Measurement Data Source

**Body size information
from 1D,3D**



**Annual Size Changes
Growth Rates
Correlations between
Measurements**

**Morphological &
Sizing information**



**Age grouping
Body Shape Change
by Age
Drop value
Size Blocking**

AnthroData Information Tool

Solutions

**Access to body size &
Shape information**

**Access to Sizing
information**

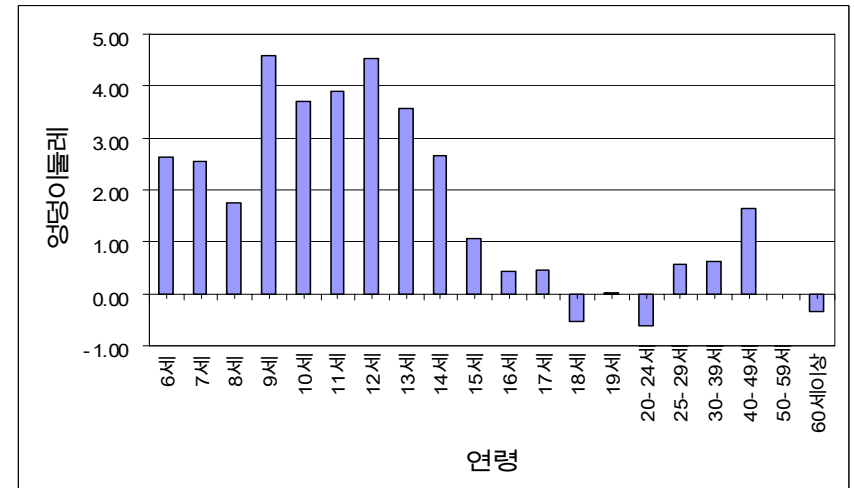
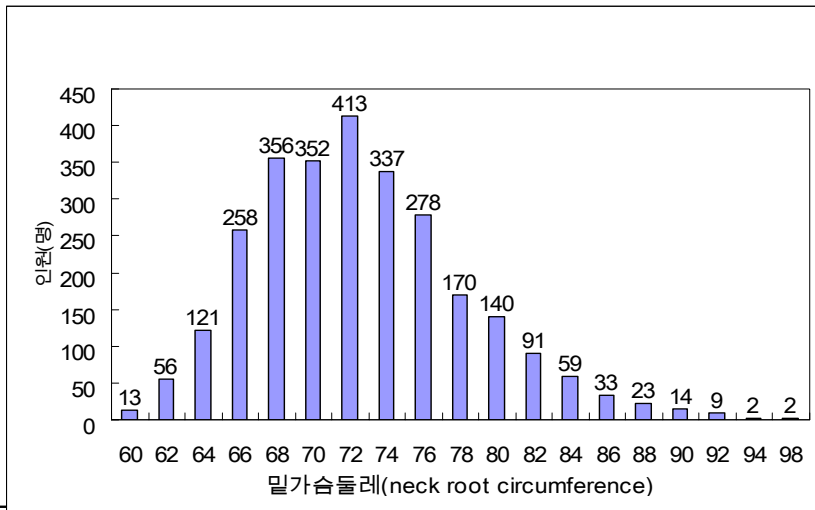
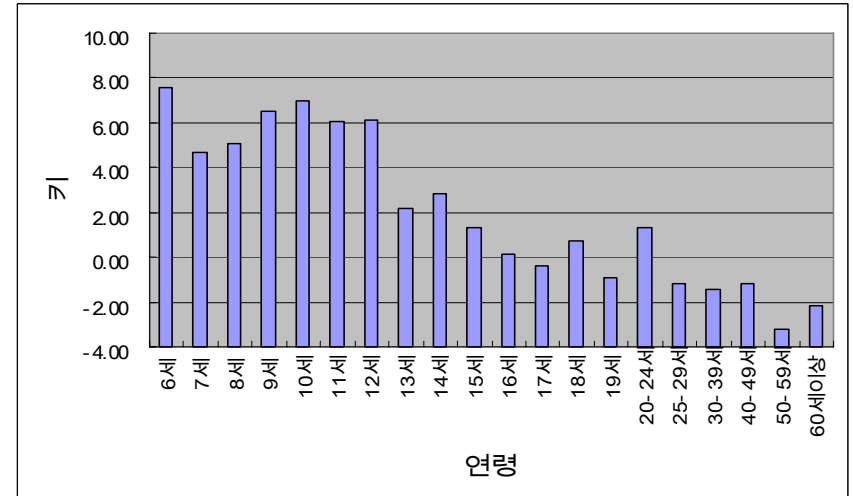
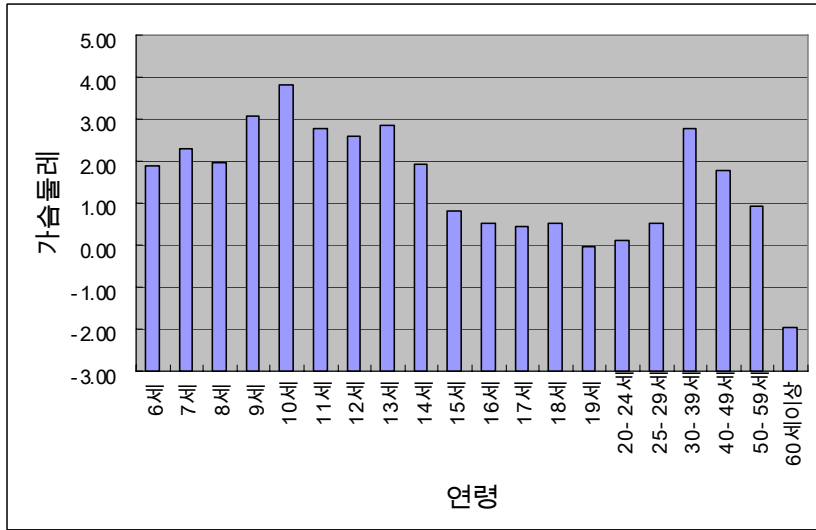
**Access to Market
Share information &
Standard**



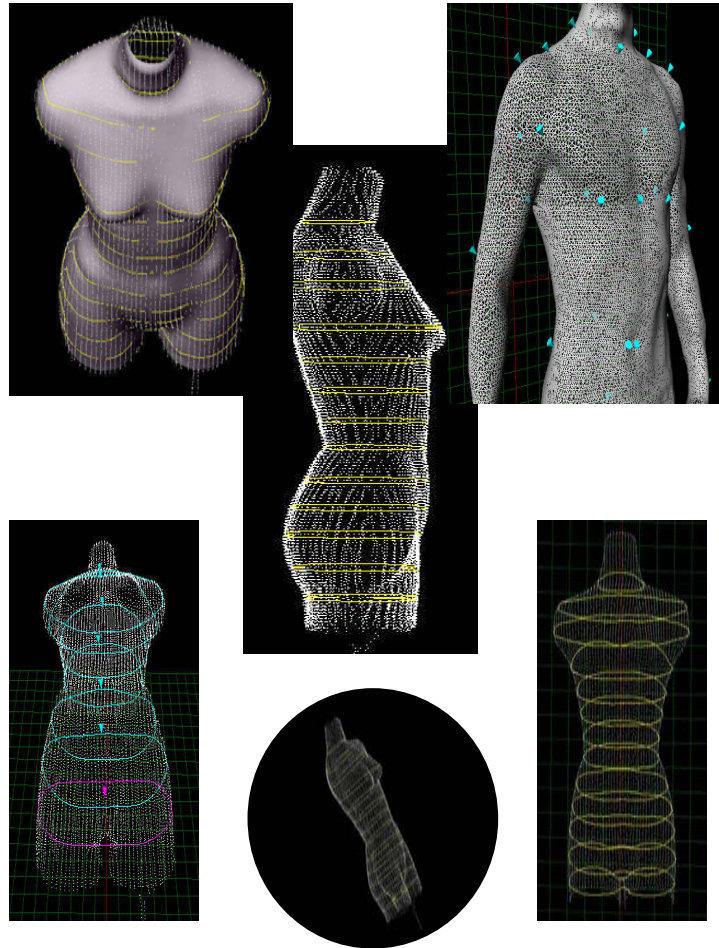
Contents

**Country, Gender, Age
Trend Analysis
Selected Products
(Clothes, Shoes,}
Selected Target
Key Dimension
2ndary Dimension
Size Compatibility
Furniture, Housing,
Construction, Cars**

Annual body size changes by Growth

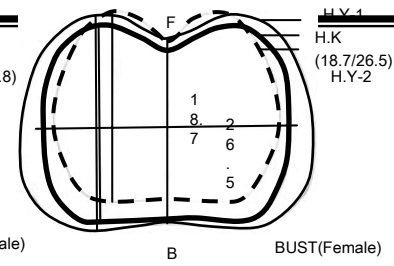
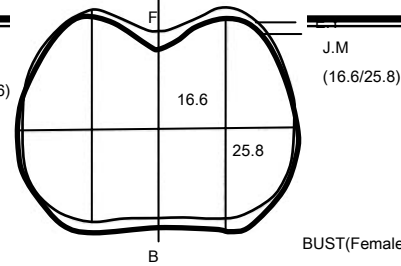
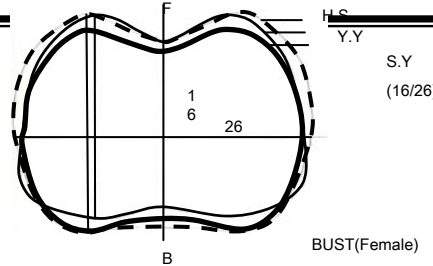
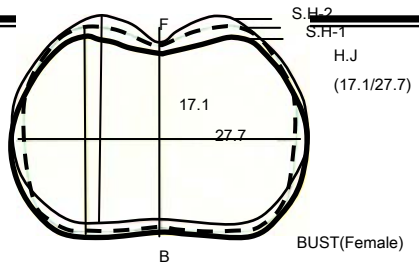


Body shape data from 3D (Flat , Side View)

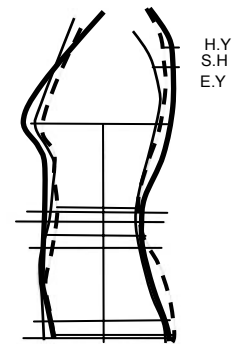
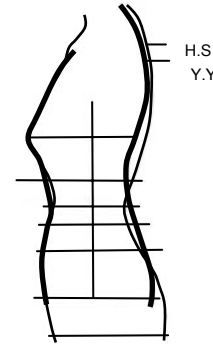
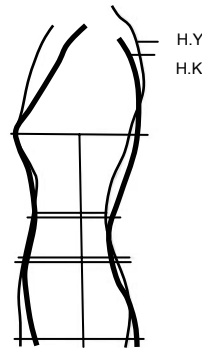
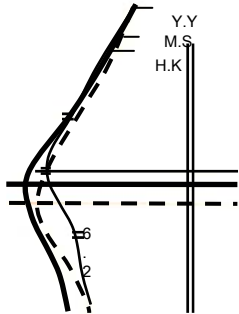


3D Body silhouette information(1)

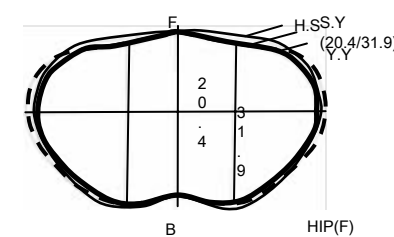
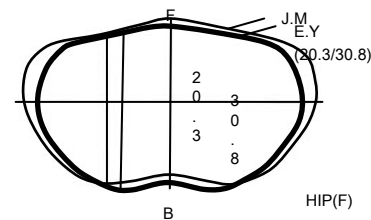
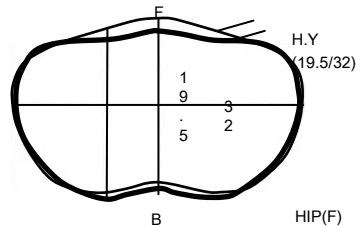
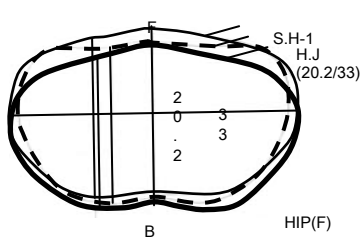
Female Bust



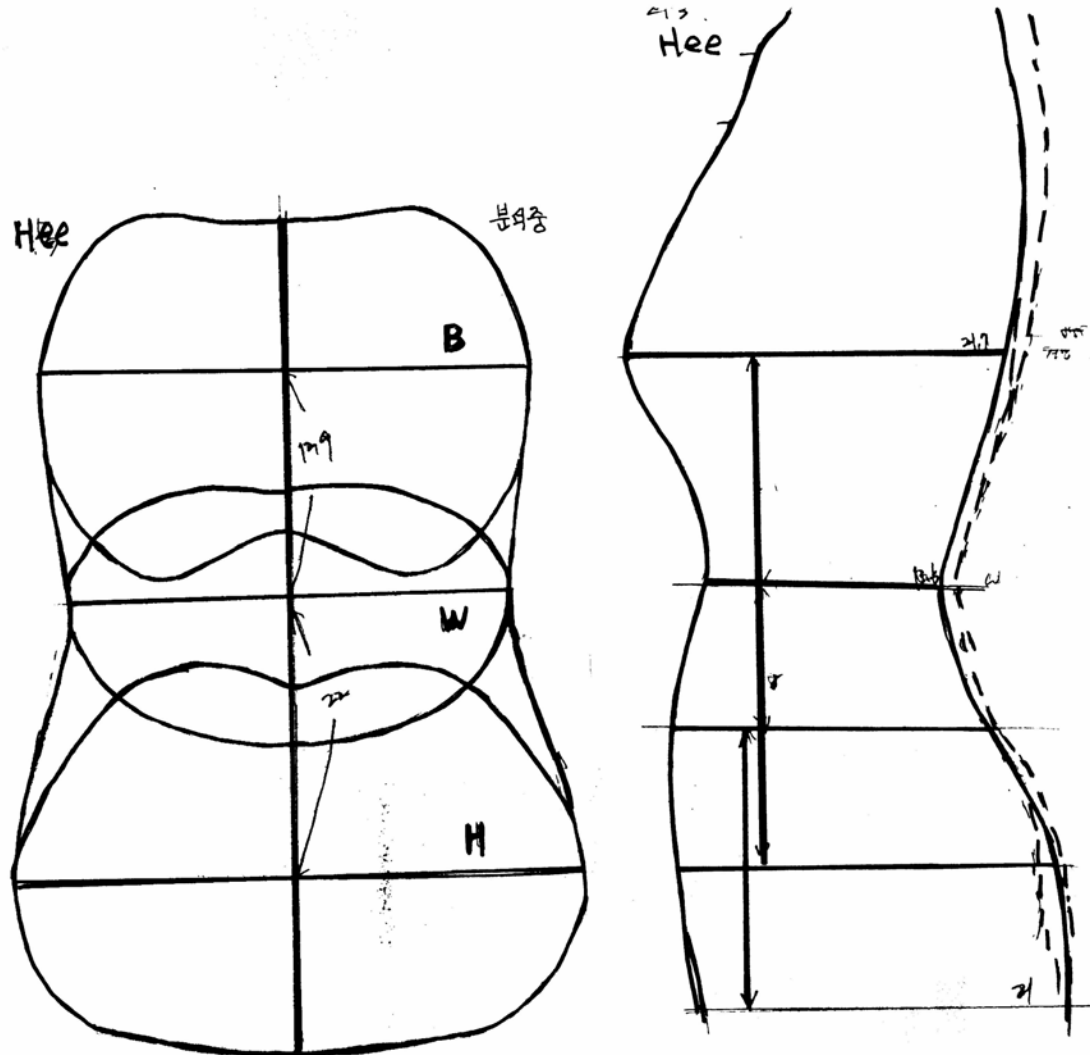
Female Side



Female Hip

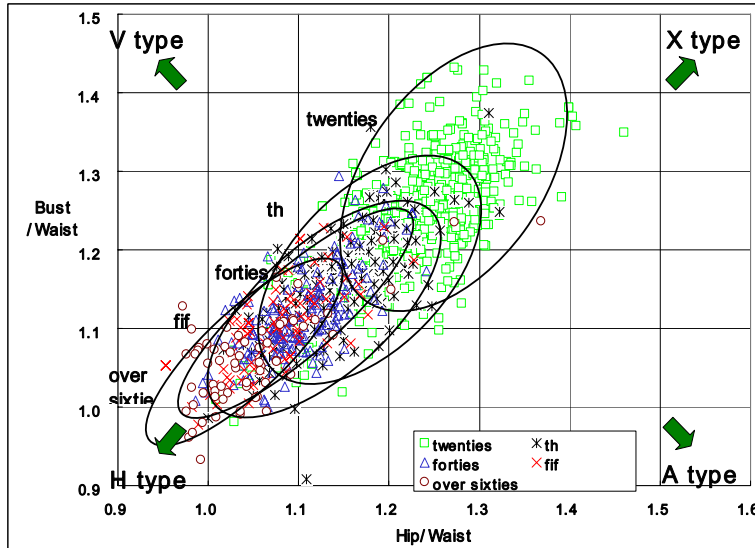


Ideal Silhouette proportion in Twenties

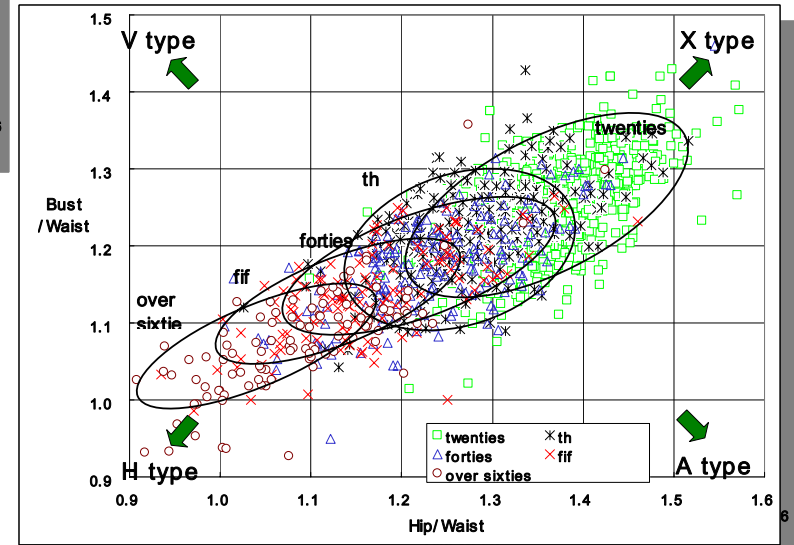


Body Shape Change by Age

Male



Female



Standards in Anthropometric Measurement

ISO 7250 :

Anthropometric Surveys-Body Dimensions

ISO 8559 :

**Garments Construction and Anthropometric
Surveys-Body Dimensions**

Crotch Height : ISO 7250

Dimension	Crotch Height : ISO 7250
Definition	Vertical distance from the floor to the distal part of the inferior ramus of the pubic bone. Subject first stands with legs a maximum of 100mm apart
Method	and the movable arm of the measuring instrument is placed against the inner surface of the thigh in such a way that, when pushed higher, it gently presses against the pubic bone. Subject then closes the legs and stands fully erect during the measurement.
Instrument	Anthropometer.

Inside leg length : Crotch Height(ISO 8559)

Inside leg length : crotch height (ISO 8559)

The distance between the crotch and the ground, measured using the tape-measure in a straight line with the subject upright, feet slightly apart, and the body mass equally distributed on both legs.

Crotch Height (NASA)

Dimension	Crotch height
Definition	The vertical distance from the standing surface up into the crotch until light contact is made. The subject stands erect, heels approximately 10cm. apart, and weight distributed equally on both feet.
Application	Sizing of clothing and personal protective equipment.

Sizing Standards of Clothes in ISO

- ISO3635 Size Designation of Clothes. Definition and Body Measurement Procedures**
- ISO3636 Size Designation of Clothes-Men's and Boys' Outwear Garments**
- ISO3637 Size Designation of Clothes-Women's and Girls' Outwear Garments**
- ISO4415 Size Designation of Clothes- Men's and Boys' Underwear**
- ISO4416 Size Designation of Clothes-Women's and Girls' Underwear, Nightwear**
- ISO8559 Garments Construction and Anthropometric Surveys-Body Dimensions**

Sizing Standards of Clothes in ASTM

**ASTM
D 5586** **Standard Tables of Body
Measurements for Women**

**ASTM
D 5219** **Terminology Reverting to a Body
Dimensions for Apparel Sizing**

**ASTM
D4910** **Standard Tables of Body
Measurements for infants**

Standard Organizations

- **BSI** (British Standard Institute)
- **ANSI** (American National Standard Institute)
- **DIN** (Deutscher Normenausschuss)
- **JIS** (Japanese Industrial Standard)
- **AFNOR** (Association French Norme)
- **ISO** (International Organization for Standardization ; 1947)

Classification Age Groups

ISO	ASTM	AFNOR	JIS	KS
Men	Men	Homme	Men	Men
Women	Women Missy	Femme	Women	Women
Boys'	Junior	Garcon	Boys	Junior
Girls'		Fille	Girls	
Infants	Infants	Enfant	Infants	Infants

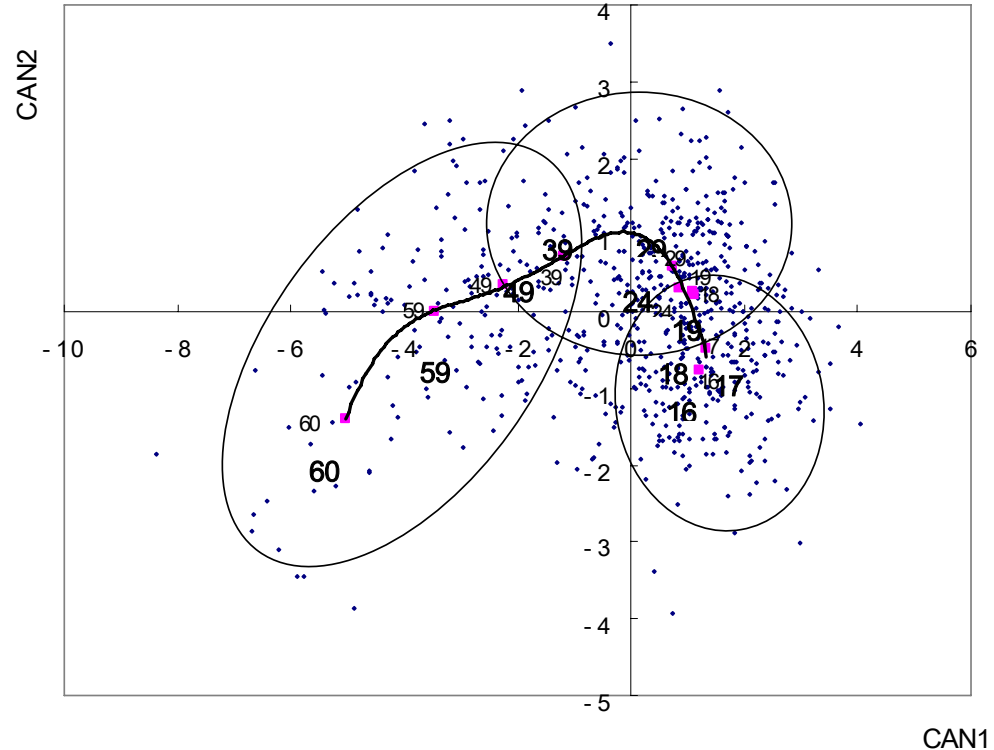
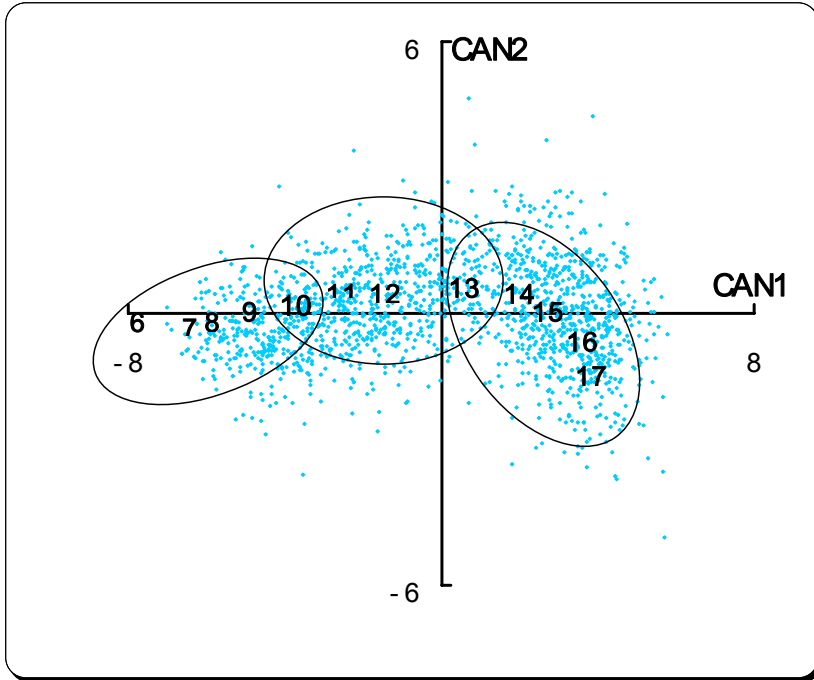
Classification in Body Shape(Women)

ISO		AFNOR	ASTM	JIS	KS	
A type	12	M	Miss Petite (151-159cm)	A type S 142-166cm(8cm) B 74- 94cm(3cm) H 92-104cm(4cm)	A type	12
			Miss (159-170cm)			
M type	6	N	Miss tall (169-177cm)	Y type Hip(Atype-4cm)	N type	6
			Adult Missy (161-173cm)			
H type	0	F	Women (162-170cm)	AB type Hip(Atype+4cm)	H type	0
			Half (152-163cm)			

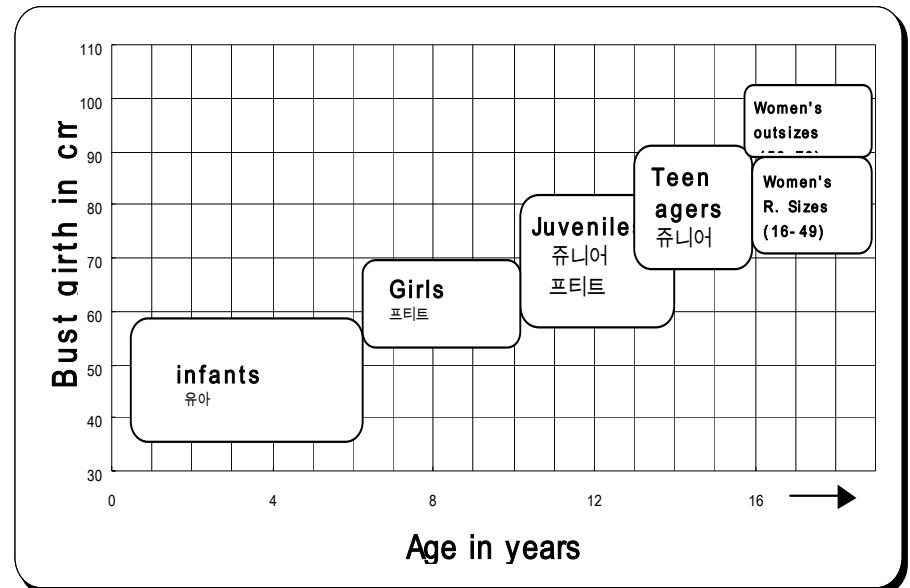
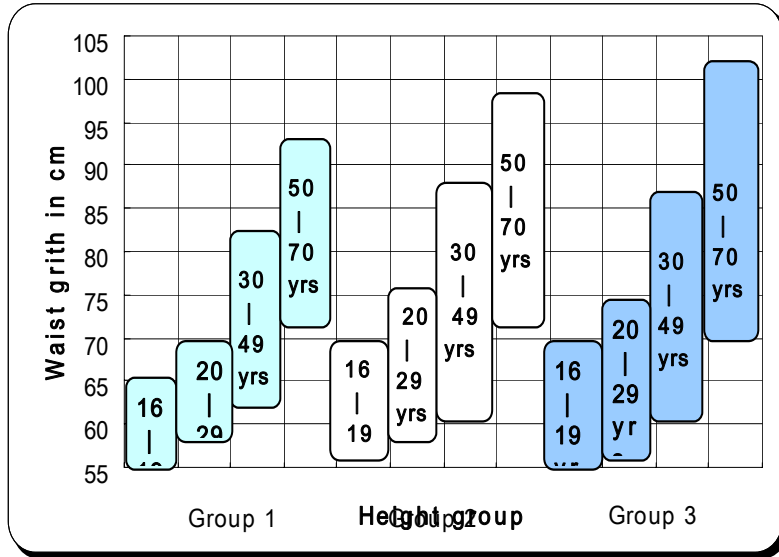
Classification in Height(Women)

ISO		AFNOR		ASTM		JIS		KS	
S	160	S	152	Miss		Petite	150	Petite	145-155
				Short	151-159				
R	168	R	160	M	159-170	Regular	158	Regular	155-165
				Tall	169-177				
				Adult		Tall	160		
L	176	L	168	M	161-170			PP	142
				S	152-163				

Age Grouping for Body Shape



Size range in each age group



Cover rate in each body shape

16- 70 Years (105명=100%)														
H p	78	80	82	84	86	88	90	92	94	96	98	100	102	Tot al
Bust	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	(%)
67cm														
70cm	0.95	0.95	0.95											2.85
73cm		1.9	0.95	0.95	0.95	0.95	B형							5.70
76cm	0.95		3.81	1.9	0.95									7.61
79cm			1.9	4.76	3.81	0.95	0.95							12.37
82cm		0.95		0.95	1.9	1.9	3.81							9.51
85cm			0.95	0.95	5.71	3.81	7.62	2.86	0.95					22.85
88cm				Y형	0.95	1.9	5.71	0.95						9.51
91cm			0.95		1.9	1.9	1.9	3.81	2.86					13.32
94cm					0.95		1.9	1.9	2.86	0.95	A형			8.56
97cm								0.95			0.95		0.95	2.85
100cm									1.9		0.95			2.85
103cm														
106cm												0.95		0.95
109cm												0.95		0.95
Tot al	1.90	3.80	9.51	9.51	17.12	11.41	21.89	10.47	8.57	0.95	1.90	1.90	0.95	100

Cover Rate between Bust and Hips

Table Bust and Hip girth relationships of six aging groups in Height 145- 149cm

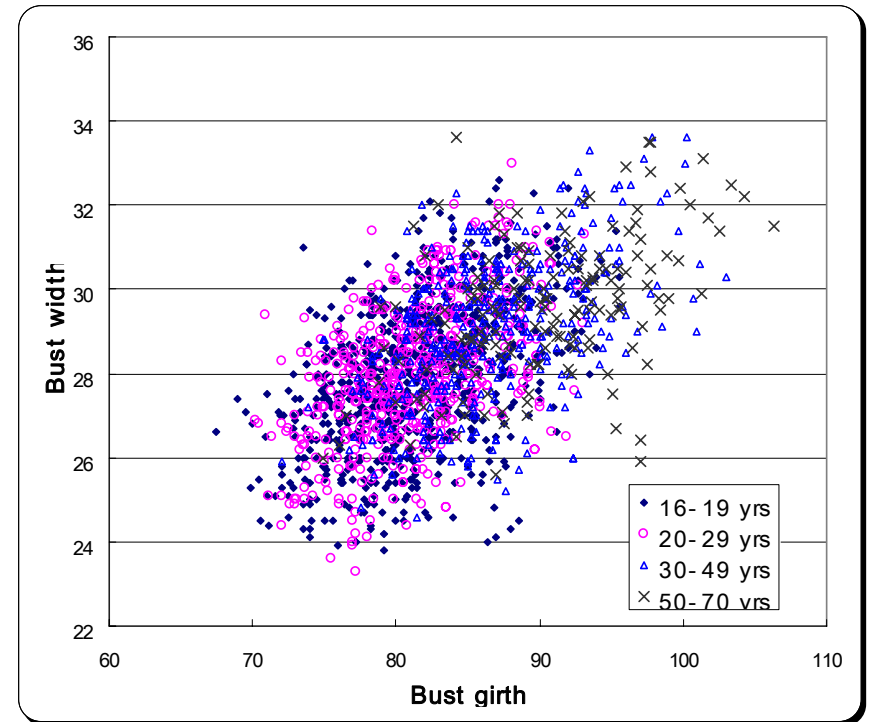
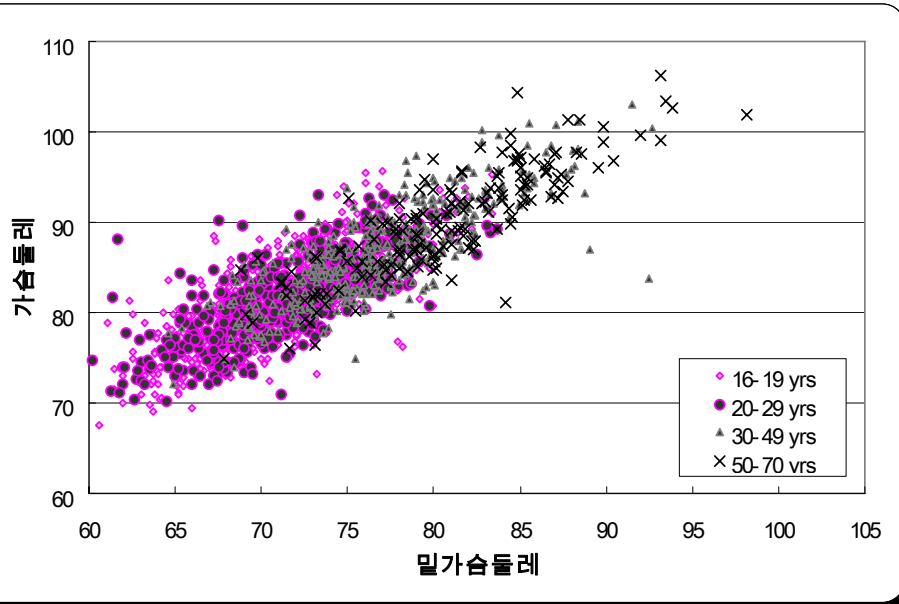
16- 70 Years 여자 (105명=100%)

Hip	78	80	82	84	86	88	90	92	94	96	98	100	102	Total
Bust	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	(%)
67cm														99.9
70cm	1	1	1											2.85
73cm		1.9	1	1	0.95	1								5.7
76cm	1		3.8	1.9	0.95									7.61
79cm			1.9	4.8	3.81	1	1							12.4
82cm		1		1	1.9	1.9	3.8							9.51
85cm			1	1	5.71	3.8	7.6	2.9	1					22.9
88cm					0.95	1.9	5.7	1						9.51
91cm			1		1.9	1.9	1.9	3.8	2.9					13.3
94cm					0.95		1.9	1.9	2.9	1				8.56
97cm								1			1		1	2.85
100cm									1.9		1			2.85
103cm														
106cm												1		0.95
109cm												1		0.95
Total	1.9	3.8	9.5	9.5	17.1	11	22	10	8.6		1.9	1.9	0	94.2

Hip-Waist Distribution 18-70yrs

● 16-70세														
Hip	78	80	82	84	86	88	90	92	94	96	98	100	102	Total
Waist	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	
54cm	0.14	0.14												0.28
56cm			0.42		0.28	0.14								0.84
58cm	0.14	0.14	1.54	1.68	0.98	1.12	0.14	0.14						5.87
60cm		0.42	1.12	2.1	2.94	2.1	0.7	0.42						9.79
62cm	0.14	0.14	0.7	1.82	4.9	3.5	1.54	0.7	0.28	0.28	0.14			14.13
64cm			0.28	1.4	2.52	4.2	3.92	1.54	0.56	0.14				14.55
66cm			0.28	0.42	1.96	2.66	4.9	2.94	1.54	1.12	0.7			16.5
68cm				0.28	0.42	1.4	2.8	2.94	2.52	0.7	0.42			11.47
70cm				0.14	0.7	0.98	2.24	0.98	0.98	1.26	0.56			7.83
72cm		0.14			0.14	0.7	0.84	1.54	1.26	0.7	0.42			5.73
74cm					0.28	0.42	0.56	1.4	2.66	0.56	0.14			6.01
76cm							0.14	0.84	0.56	0.28	0.84	0.14	0.14	2.94
78cm							0.28	0.28	1.12	0.14		0.14		1.96
80cm							0.14		0.28		0.28	0.14		0.84
82cm									0.14		0.14			0.28
84cm									0.14					0.14
86cm											0.28			0.28
88cm					0.14									0.14
90cm							0.14							0.14
92cm														
94cm														
96cm									0.14				0.14	0.28
98cm														
Total	0.42	0.98	4.34	7.83	15.24	17.2	18.32	13.71	12.17	5.17	3.92	0.42	0.28	715(N)

Size Distribution between Bust and UB



Definition of Body Shape

Men (Drop=chest-waist)

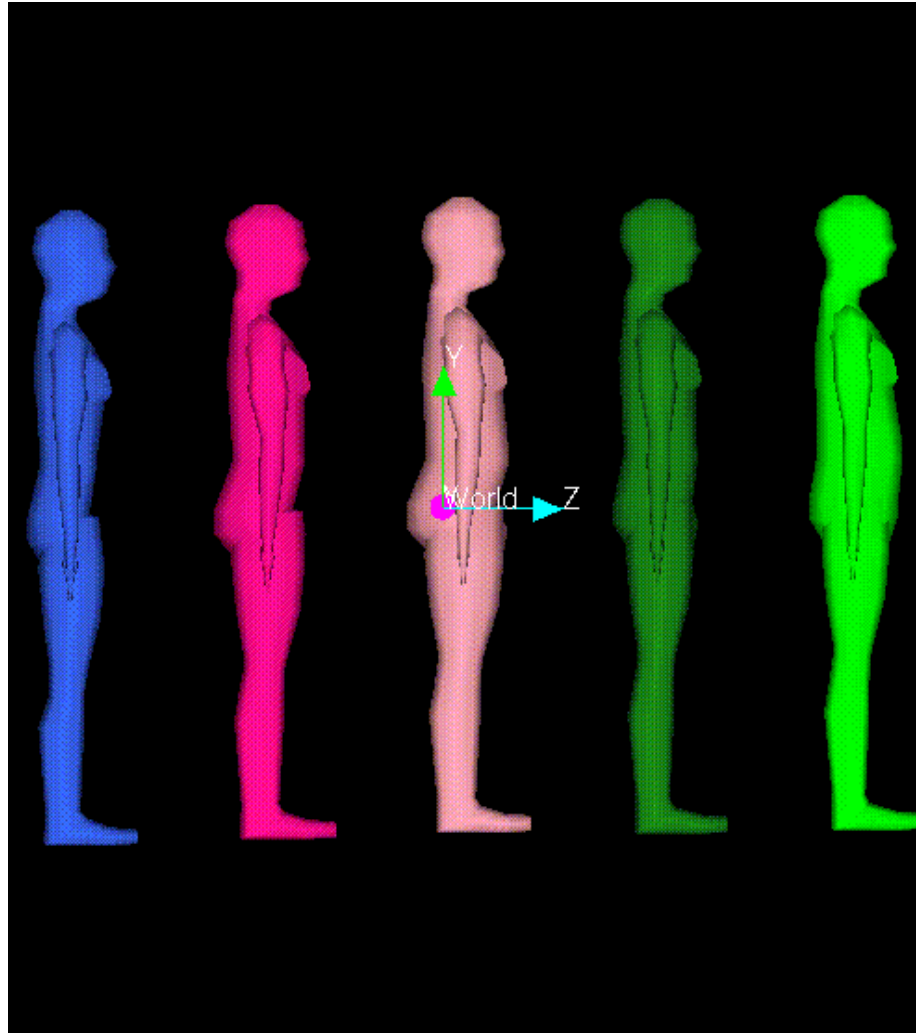
Women (Drop=bust-hip)

Breast size (Drop=bust-underbust)

Drop Values in Women

Height Body shape	Petite	Regular	Tall
	145 ~ 155cm	155 ~ 165cm	165 ~ 175cm
N type (Drop 6)	Drop 4 ~ 0cm	Drop 4 ~ 2cm	Drop 6 ~ 2cm
A type (Drop 12)	Drop 10 ~ 14cm	Drop 10 ~ 16cm	Drop 12 ~ 18cm
H type (Drop 0)	Drop -4 ~ 4cm	Drop -1 ~ 6cm	Drop 0 ~ 7cm

Body Shape A. N. H



Drop Values in Height 160-165cm

신장 160-164cm 구간													
(Bust Height 등의 단위는 cm)													
Bust	67	70	73	76	79	82	85	88	91	94	97	100	Total(%)
160-4			D15										1.38
				D14									2.07
			D13		D13		D13						5.25
				D12		D12							7.04
			D11		D11		D11						8.56
				D10		D10							9.94
			D9		D9		D9						11.05
				D8		D8							7.59
					D7		D7						6.9
						D6		D6					5.39
					D5		D5						5.8
						D4		D4					4.97
							D3		D3				4
						D2		D2					2.62
Total(%)			6.22	12.7	19.2	20.56	16.28	6.39	1.24				82.56

Drop Values in Height 165-170cm

신장 165- 169cm 구간													
(Bust Height 등의 단위는 cm)													
Bust	67	70	73	76	79	82	85	88	91	94	97	100	Total(%)
165-9			D19										1.14
			D17										1.14
				D16									1.14
			D15		D15								5.56
				D14									1.9
			D13		D13								4.94
				D12		D12							9.88
			D11		D11		D11						7.22
				D10		D10		D10					12.54
					D9		D9						9.12
				D8		D8		D8					10.26
					D7		D7						6.84
						D6		D6					6.46
						D5		D5		D5			6.46
							D4		D4				4.56
							D3					1.9	
								D2				1.52	
							D1		D1			2.28	
Total(%)			10.12	11.02	20.14	23.56	13.68	9.5	3.42				94.86

Key Dimensions

Mens Wear : chest, waist, height

Womens Wear ; bust, hip, height

Brassier : underbust, cup size

Pants : waist, hip

Sizing Systems and Designation for Clothes

ISO

B, W, H
Body size

Size Code

42, 44...
2, 4, 6...

S. M. L.XL..
100. 105.110

Size 55 Spec. (Young Women)

Height	Bust	Waist	Hip	Back	Arm L.
160	85	64	92	38	57

Drop 6 : 47.4%(Standard)

Drop 12 : 42.7%(Broad Hip)

Correspond to ASTM4 (84,64,90,163) ?

ASTM6 (86,66,93,164) ?

Size Designation Systems

(KS=ASTM)

Size	44=4	55=6	66=8	77=12	88=14
Code (ISO)	82-88- 155	85-92 -160	88-96- 160	94-100- 165	97-106- 165
Height	155	160	160	165	165
Bust	82	85	88	94	97
Waist	61	64	67	73	79
Hip	88	92	96	100	106

Comparing samples (USA, Women) (I)

Miss Tall (169-177)	code	MT10	MT12	MT14	MT16	MT18	MT20	MT22	
	Bust	84.3	90.1	93.7	97	101.5	106.5	113.9	
	Waist	72.4	77.9	82.0	85.7	90	96.1	104.6	
	Hip	95.1	98.8	101.8	105.4	108.2	112.2	119.6	
	HT	169	171	172	174	175	177	177	
Half (152-163)	code	12.5	14.5	16.5	18.5	20.5	22.5	24.5	26.5
	Bust	94.4	100.3	104.6	108.3	111.1	116.3	120.7	126.3
	Waist	82	88.6	94.0	97.7	101.4	106.7	109.6	116.2
	Hip	96.6	102.4	107.8	111.2	115.2	120.2	124.7	128.8
	Ht	152	153	154	157	159	160	161	163

Comparing samples(USA, Women) (II)

CAESAR data(12 :92-74-100-166cm)

Wome- ns (162- 170)	code	W 34	W 36	W 38	W 40	W 42	W 44	W 46	W 48	W 50	W 52
	Bust	99	103	108	112	117	119	127	129	140	148
	Waist	87	92	98	102	106	111	116	126	125	132
	Hip	103	108	112	117	118	127	128	136	134	158
	HT	162	164	165	166	169	169	169	169	166	164
Adult missy (161- 173)	code	2	4	6	8	10	12	14	16	18	20
	Bust	81.3	84	86	89	91	95	99	103	108	113
	Waist	61	64	66	69	71	75	79	83	88	93
	Hip	86	90	93	95	98	102	105	109	114	119
	HT	161	163	164	165	166	168	169	170	172	173

Key Dimensions (ASU, Women) 16=12ASTM

Slim Hips	code	10	12	14	16	18
	Bust	80	85	90	95	
	Waist	60	65	70	75	
	Hip	80	85	90	95	
	Height					
Full Hips	code	10	12	14	16	18
	Bust	80	85	90	95	
	Waist	60	65	70	75	
	Hip	90	95	100	105	
	Height					

Define the 2ndary Dimensions

1. Outwear

Arm length, shoulder length...

2. Pants :

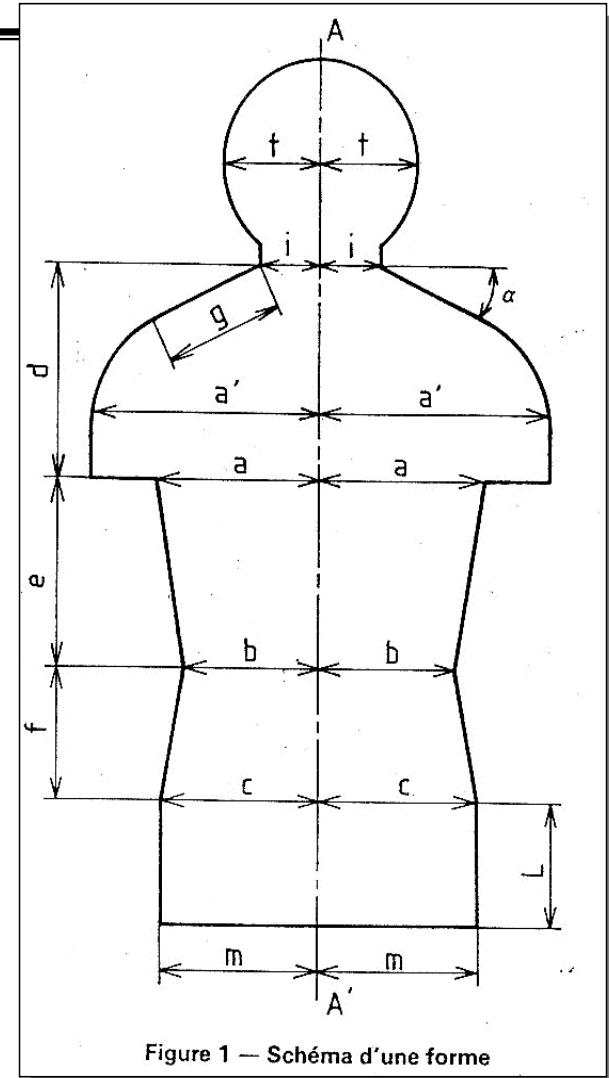
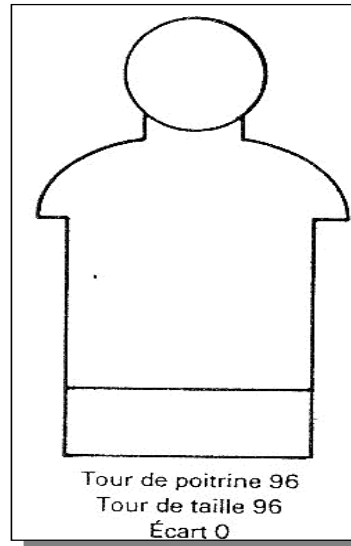
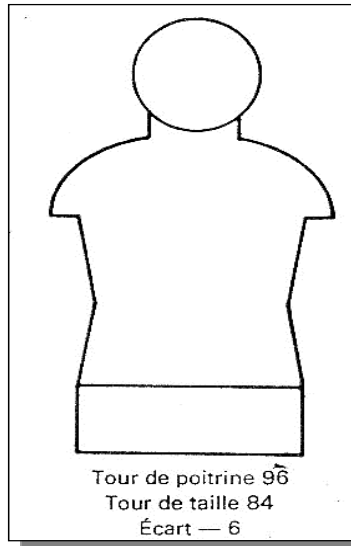
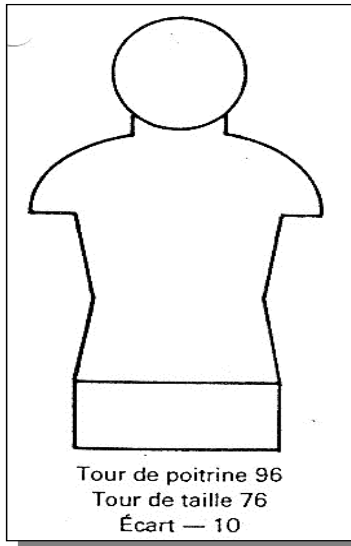
Inseam length, out-seam length, crotch length...

3. Brassiere and Corset :

Bust depth, bust width, Hip depth.....

Size sectors for innerwear design

Size sectors for innerwear design



2ndary dimensions information

키 Height	항목	정꼭지 가격 B P		목둘레 Neck C.		목밑둘레 U Neck C.		앞폭 Front W.		뒤폭 Back W.		지동두께 Scve D.		밑위앞뒤길이 Crotch	
		Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
141cm		12.8		29.3		36.4		27.8		31.7		9.4		60.2	
142cm		14.9	1.0	32.4	0.8	37.9	1.3	29.8	0.1	34.7	2.8	11.7	1.1	70.0	2.1
143cm		13.4		28.7		34.1		29.7		31.7		10.8		62.8	
한계		14.0	1.2	30.7	2.0	36.6	1.9	29.3	1.0	33.2	2.4	10.9	1.2	65.7	5.1
145cm		18.2		31.5		36.0		28.5		32.0		10.4		60.0	
146cm		16.7	2.1	32.5	1.3	38.6	2.4	30.3	0.4	35.3	0.8	12.7	1.0	68.5	5.9
147cm		16.5	2.5	34.0	1.9	38.3	1.4	31.3	0.8	35.4	1.1	12.5	1.3	70.4	4.9
148cm		18.4	2.4	32.0	2.1	36.9	2.3	30.8	1.3	35.4	1.2	12.0	1.5	71.4	4.4
149cm		18.3	2.0	32.0	1.5	38.1	2.2	31.1	1.7	35.5	2.0	11.8	1.7	70.4	6.4
한계		17.6	2.2	32.4	1.7	37.9	2.1	30.8	1.3	35.2	1.5	12.1	1.4	69.7	5.6
150cm		15.6	1.9	31.8	2.0	37.8	2.5	30.5	1.0	36.0	1.7	11.6	1.3	66.4	5.6
151cm		16.6	2.2	31.3	1.7	36.8	1.1	31.0	0.8	36.2	1.8	11.8	1.2	67.1	5.3
152cm		17.7	1.6	33.1	1.7	38.1	1.1	31.5	1.3	37.1	1.3	13.5	1.3	70.9	3.7
153cm		17.8	2.9	32.6	1.1	38.5	1.8	31.8	0.8	36.6	1.4	12.3	1.0	67.7	3.4
154cm		16.0	2.0	31.0	0.9	36.1	2.0	30.1	1.1	35.0	2.2	11.3	1.5	68.1	4.1
한계		16.8	2.3	32.0	1.6	37.6	1.9	31.0	1.1	36.3	1.7	12.1	1.4	67.8	4.6
155cm		16.8	1.9	31.9	2.1	38.2	1.8	31.3	1.6	36.2	2.0	11.3	1.1	68.4	5.7
156cm		16.5	1.7	32.5	2.3	37.7	2.8	31.8	1.7	36.6	0.9	11.3	1.9	68.5	3.8
157cm		18.0	2.6	31.8	1.1	37.4	1.1	31.3	1.1	36.5	2.0	12.4	1.3	71.5	2.9
158cm		16.1	1.7	31.6	1.7	38.1	1.1	31.3	1.7	36.4	0.9	10.5	1.3	67.4	3.3
159cm		17.5	2.2	33.5	2.0	38.1	2.3	30.9	1.6	36.7	1.0	12.0	1.6	68.4	3.8
한계		16.9	2.0	32.1	2.0	38.0	1.8	31.3	1.5	36.4	1.6	11.5	1.4	68.6	4.6
160cm		16.9	0.9	32.1	1.4	39.0	0.6	32.9	1.8	37.8	2.0	11.7	1.3	69.4	3.2
161cm		19.1		35.0		42.1		32.9		37.5		12.7		76.7	
162cm		18.7	1.0	31.0	1.1	35.8	0.8	31.6	1.8	34.5	1.6	11.2	1.1	70.0	0.3
한계		17.5	1.4	32.5	1.8	38.6	2.1	32.3	1.5	36.9	2.1	11.6	1.1	70.8	3.3

Comparing Samples(Germany, France)

DIN Size	17	18	19	20	21	22	23
bust	80	84	88	92	96	100	104
waist	65	68	72	76	80	84	88
hip	90	94	97	100	103	106	109
height	160	160	160	160	160	160	160

AFNOR Size	34n	36n	38n	40n	42n	44n	46n	48n
bust	80	84	88	92	96	100	104	110
waist	58	61	65	69	73	76	80	85
hip	84	88	92	96	100	104	108	112
height	160	160	160	160	160	160	160	160

Comparing Samples(ISO, ASTM)

ISO Size	80	84	88	92	96	100	104
bust	80	84	88	92	96	100	104
waist	63	69	74	79	83	87	92
hip	87	92	96	99	103	106	109
height	160	160	160	160	160	160	160

ASTM Size	2	4	8	10	12	14	16
bust	81	84	89	91	95	99	103
waist	61	64	69	71	75	79	83
hip	86	90	95	98	102	105	109
height	161	163	165	166	168	169	170

Comparing Samples(Italy, KS)

KS Size	79	82	88	91	94	100
bust	79	82	88	91	94	100
waist	65	67	73	74	76	80
hip	88	90	94	96	98	102
height	164	164	164	164	164	164

Italy Size	38	40	42	44	46	48	50	52
bust	80	84	88	92	96	100	104	110
waist	59	62	65	69	73	77	81	85
hip	86	90	94	98	102	106	110	116
height	164	164	164	164	164	164	164	164

Comparing Drop Values(B-Hip,ISO,ASTM)

Drop	-8	-6	-4	-2	0	2	4	6	8	10	12	14	16	18	20		
ISO					Broad			A			A						
							M		M		M		Standard				
KS			H		H		H		H		Slim hips						
							Broad		A		A		A		A		
						N		N		N		N		Standard			
				H		H		H		H		Slim hips					
AS TM								Junior			J		J		J		
								Junior petite									
					Misses			M		M		M		M		M	
					Miss Petite			MP		MP		M					
					Miss tall					MT		M		MT			
					Adult female misses					AM		AM					
					Womens			W		W		w		W			
				Half													

Comparing Drop Values(JIS, AFNOR, DIN)

Drop (cm)	-8	-6	-4	-2	0	2	4	6	8	10	12	14	16	18	20
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JIS					standard				A							
	Slim				Y	Y	Y	Y								
					Broad				AB		AB	AB				
								Extra Broad				B	B	B		
AFNOR					M	M	Mince									
					N		N	Standard								
									F	F	F	Forte				
DIN					N	N	N	N	N	N	N	Standard Hips				
	S	S	S	S	S	S	S	Slim								
									B	B	B	B	B	B	Broad	

Importance of Size Compatibility

Size Designation Systems(in case of 92cm Bust girth)

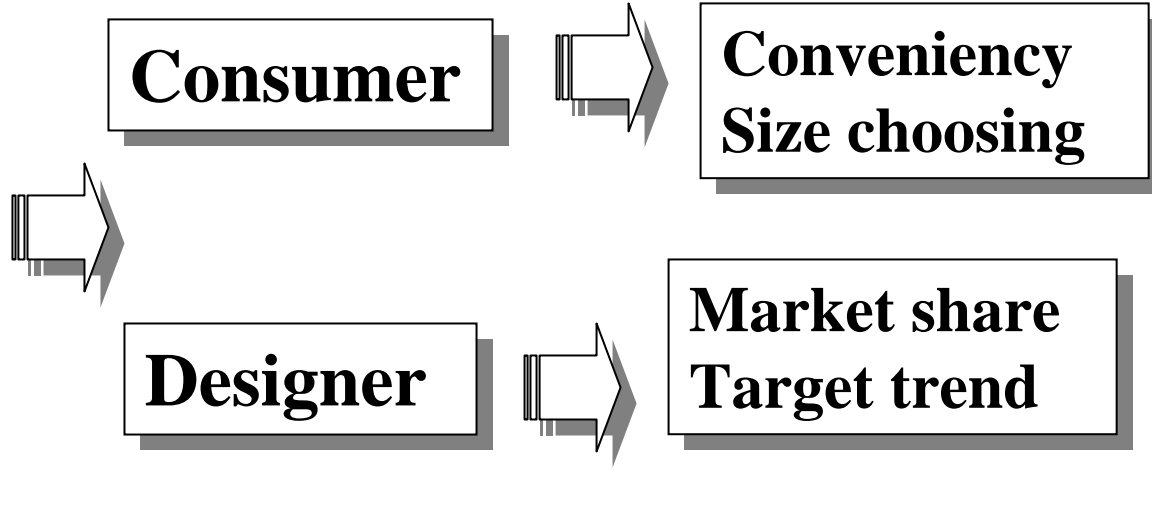
Japan 15	France 40
UK 14	Italy 44

Size Designation Systems(in case of size code 40)

	France	Germany	Italy
Bust	92cm	92cm	84cm
Waist	69	76	62
Hip	96	100	90
Height	160	168	164

Conclusions

Online information tool based on size, sizing info. Key dimension info. 2ndary dimension info, Size and Shape



We must acknowledge that the making up for the customer and designer of information tools about sizes depends much on the volume and accuracy of the data made available by each country which in turn is usually connected with its level of development.

Future works

It has been suggested that online tools could be extended to cover non-anthropometric data such as social preferences about colors, shapes, wearing behavior for such –and –articles.

As far as social preference trends(natural trends or induced trend through traditional life pattern) are concerned , online tools involving choices on a computer screen could be of course be made but they would be of a different nature : Instead of statistical data shown on charts or tables with an additional tool, social trend culture behavior report would most probably be text with picture or document to be traditionally obtained in a linear manner.