The Establishment of Apparel Size Database for Young Woman of South Fujian Area

Li-na Cui[1, a]

[1]Deparment of Arts and Design, Quanzhou Normal University, Quanzhou, P.R. China;

[a]email: cuilina-cui@163.com

Keywords: Young Woman; Classification of Figure Type; Apparel Size; Database

Abstract. In this research, 600 young women who come from South Fujian area was chosen for measurement, 15 measuring body variables were chosen and 13 derived variables were calculated. Then classification analysis was used to classify the figure type separately by the upper body and the lower body. Then this paper subdivided the upper body of young woman's figure type into 5 kinds, the lower body into 4 kinds. Finally, values of intermediate of every type and stepping number values of every measurement are calculated through regression analysis.So the database of clasification of figure type and data of young woman of South Fujian area was established.

Introduction

Nowadays, following by the improvement of people's life standard, apparel's fitness has been widely considered as an important indicator affecting clothing's appearance and comfort. The intention of body shape classification is providing the basis for the clothing's style and structure design, and it will greatly affect the fitness of clothing products. Our country is still using the old national standard of garment size; body data of this standard come from last century 90's anthropometric data[1]. However, the standard now can not truly reflect the characteristics of somatotype in china. Therefore, it is necessary to improve the apparel size database by using more reasonable shape classification method [2].

Human Body's Measurement Data Collection Experiment

In the experiment, 600 South Fujian female university students at the age of 18~ 23 are measured. This study uses the manual measurement method, in order to make the scale unified and data accurate, special groups of measurers are designated to take the measurement experiment. Testees all wore thin underwear, remain stationary and natural upright when measuring. Martin measuring instrument s and measuring reels are used in the manual measurement.

This study selected 15 human representative measurement parts, which can cover all main control parts of the whole body. They were: height, chest circumference, waist circumference, hip circumference, shoulder width, shoulder angle, neck circumference, front waist length, back waist length, upper body length, lower body length, chest horizontal length, hip horizontal length and hip height, length between hip and waist.

Analysis of Body Shape Clustering

In current national standard of apparel size, the human body shapes are divided into 4 categories. And the standard can not really reflect the size differences between human bodies[3]. Meanwhile we try to divide human shape more in detail, so this study attempts to classify the upper and lower human body separately. This research takes derived variables which can reflect human body's horizontal and vertical changes and other relevant variables as the reference index for body shape's classification. These derived variables are calculated through important controlling parts of the body. These derived variables are shown in table 1.

Tab. 1 Each derived variable and definition

derived variables	definition	derived variables	definition
R1	chest circumference - waist circumference	R8	hip circumference - waist circumference
R2	chest circumference / waist circumference	R9	hip circumference / waist circumference
R3	upper body length / chest horizontal length	R10	distance between W-H/ lower body length
R4	shoulder angle/shoulder width	R11	lower body length / hip horizontal length
R5	front waist length – back waist length	R12	lower body length / hip circumference
R6	upper body length / chest circumference	R13	lower body length / waist circumference
R7	upper body length / waist circumference		

The Body Shape Cluster Analysis

Using single factor variance analysis through SPSS statistical software, each derived variables of the upper body is inspected and analyzed separately with the key parts of upper body，upper body length, chest circumference and waist circumference. Table 2 shows F value and significance level of the single factor analysis of variance. Synthesis results show that: the variable R3 is significant with chest circumference and waist circumference [4], and close to be significant with upper body length, significant effect is better than the other four indicators; the variable R7 is significant with the upper body and waist circumference, and close to be significant with chest circumference. So this research takes these 2 variables as indicators to cluster analysis. Table 3 gives the K-MEANS cluster analysis, the index terminate clustering center and sample proportion when samples are divided into 3, 4, 5, 6 kinds. After comparing the results when samples are divided into different categories, we find out that the result that samples are divided into 5 categories, difference between each two categories show adjacent to clear and uniform. So the young female body shape is divided into 5 categories. They are indicated with Ⅰ、Ⅱ、Ⅲ、Ⅳ、Ⅴ.

By using the same method with upper body, the synthesis results show the significant effect of R9 and R8 are better than the other four indicators, so take these 2 variables as indicators for clustering analysis. And the young female lower body shape is divided into 4 categories. They are indicated with A,B,C,D, and the classification results are in table 4.

Tab. 2 Onaway anova between each derived variable and the key part of upper body

	Parts	R1	R2	R3	R4	R5	R6	R7
F value	upper body length	0.875	1.213	1.145	3.552	2.345	1.939	3.178
	chest circumference	1.339	3.879	3.785	1.876	0.876	3.097	2.056
	waist circumference	1.206	5.002	2.167	2.865	0.869	1.835	3.912
significance level	upper body length	0.478	0.543	0.058	0.001	0.003	0.022	0.001
	chest circumference	0.044	0.008	0.002	0.786	0.878	0.123	0.011
	waist circumference	0.469	0.030	0.000	0.567	0.709	0.079	0.000

Tab. 3 Final cluster center of K-MEANS and sample ratio (upper body)

Category	R3/R7	Ratio	Category	R3/R7	Ratio	Category	R3/R7	Ratio	Category	R3/R7	Ratio
1	1.02/0.43	33.0%	1	1.02/0.43	17.2%	1	0.92/0.40	8.70%	1	0.87/0.40	0.50%
2	1.27/0.51	47.2%	2	1.12/0.56	26.7%	2	1.02/0.43	15.5%	2	1.02/0.43	21.9%
3	1.22/0.73	19.8%	3	1.18/0.60	37.7%	3	1.12/0.58	34.7%	3	1.15/0.55	23.4%
			4	1.22/0.73	18.5%	4	1.18/0.60	24.2%	4	1.09/0.57	20.1%
						5	1.22/0.73	16.9%	5	1.19/0.66	22.2%
									6	1.23/0.72	11.9%

Tab. 4 Cluster result of body type

Category	R3	R7	Sample number	Category	R9	R8	Sample number
Ⅰ	0.92	0.40	52	A	1.25	2.69	121
Ⅱ	1.02	0.43	93	B	1.32	2.90	183
Ⅲ	1.12	0.58	208	C	1.38	3.01	198
Ⅳ	1.18	0.60	145	D	1.36	3.19	98

Determination of Intermediate Type Values and Stepping Values of Each Measurement Parts

Determination of Intermediate Type Values of Each Measurement Parts

Filtering out sample body with each figure types of the upper and lower body, we can obtain 7 data files. Take the mean values of anthropometric data as the final values intermediates body type, for the consideration of the convenience of data application, some simplifications were done to the data, the results are in Table 5 and table 6.

Tab. 5 Reduced measurement data of intermediate type of upper body cm

categaory	Upper body length	Chest circumference	Waist circumference	Shoulder width	Neck circumference	Shoulder angle	Chest horizontal length
Ⅰ	37.5	84.0	67.5	39.0	34.0	21.5	35.5
Ⅱ	38.5	82.5	66.5	38.5	33.5	21.5	34.5
Ⅲ	39.5	81.0	65.0	38.0	33.0	22.0	33.5
Ⅳ	40.0	80.5	63.5	37.5	32.5	22.5	33.0

Tab. 6 Reduced measurement data of intermediate type of lower body cm

categaory	Lower body length	Waist cicumference	Hip cicumference	Hip horizontal length	hip height
A	97.5	69.0	93.5	35.5	20.0
B	99.5	67.5	91.5	34.5	21.0
C	101.5	65.5	89.0	33.5	22.0
D	103.5	62.5	86.5	32.5	23.0

Determination of Stepping Values of Each Body Shape

In this research, the stepping number of the three basic control of parts of the body (body height, chest and waist) will be smaller than the current standard of 5 • 4 series, we consider 2.5• 2 series. So, values of each measurement parts can be calculated by simple or duality linear regression with body height and chest circumference, mathematical model of regression is: $y = \alpha x1 + \beta x2 + \gamma$. So as long as we get the stepping values of basic parts of human body,we can calculate each measurement parts' stepping values [5].So, the stepping values of each part= α *stepping values of height+ β *stepping value of chest。Results are simplified as shown in table 7.

Tab. 7 Stepping values of measured parts of upper and lower body cm

measured parts	Stepping value					**measured parts**	Stepping value			
	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅴ		A	B	C	D
Upper body length	0.70	0.60	0.60	0.70	0.7	Lower body length	1.9	2.0	2.1	2.2
Chest circumference	2.0	2.0	2.0	2.0	2.0	Waist circumference	2.0	2.0	2.0	2.0
Waist circumference	2.0	2.0	2.0	2.0	2.0	Hip cicumference	2.0	1.9	1.8	1.7
Shoulder width	0.8	0.9	0.9	0.8	0.8	Hip horizontal length	0.9	0.9	0.8	0.8
Neck cicumference	1.2	1.1	1.2	1.1	1.1	Hip height	0.5	0.5	0.5	0.6
Chest horizontal length	0.50	0.60	0.50	0.60	0.5					

Conclusion

Using SPSS statistical analysis software to analyze the measuring data, through the single factor analysis of variance, upper and lower body indexes were obtained, and further through K-MEANS quick cluster, the youth female upper and lower body are respectively divided into 5 and 4 categories respectively, Finally, the stepping value and intermediate type values can provide a powerful data support for young woman's clothing production enterprises.

Reference

[1] Bai lihong, Zhang wenbin, Classification methods of figure type in the female garment size standards: Journal of Textile Research, 2006, (7):113-116.

[2] Wu songgou, Discussion on Body Figure Division and Classif ication System of Boys of 6～9 Years old in Liaoning Province of China:Journal of Beijing Institute of Clothing Technology [J]. 2007.27(3): 116-119.

[3] Dai hong, Apparel size standard and applications:Edition 2, Beijing: China textile press, 2001:38-45.

[4] Zou ping. Wu songgou, Amendment of f igure types and grading values of youngwomen in China Northeast area:Journal of Textile Research, 2009, 30(11):115-119.

[5] Huang Canyi. Zhang xin, Analysis on neck clustering of young men and size specifications of shirts[J] : Journal of Textile Research, 2007(1):91-93