Analyzing the Shape of the Upper Part on the Middle-Aged Male Body in Ho Chi Minh City – Vietnam

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Abstract

The cross-sectional research method was used to analyze the shape of the upper body of middle-aged men. The 3D anthropometric measurements data was collected from 378 different men aged 30-60 in HCMC by using the 3D Size Stream Body Scanner. Later the data was processed by statistical probability math and SPSS 25 software. The statistics indicate that most of the surveyed people have higher left shoulder height than their right shoulder height. The increase in circumference indexes leads to the wide index of the circumference increase. As people get older, their body height tends to decrease. The older people get, the bigger their chest size and waist size circumference indexes become with the front part increases more than the back part.

Keywords: The top of body, middle-aged male, analysis the shape of body, Ho Chi Minh City.

1. Introduction

Vietnam's textile and garment industry has been developing strongly and plays an increasingly important role in economic growth of the country. Nowadays, in Vietnam the garment market is developing very strongly, serving local consumer demands. Characteristics of human body play an important role in designing costume styles. The changes in living conditions makes the body shape change. The Atlas for Anthropology of Vietnamese people in working age since 1986 [1] was no longer fit with the human body shape these days, therefore, studying the shape of middle-aged male body aged 30-60 in Ho Chi Minh City has an vital meaning for the fashion industry to be able to come up with timely design solutions to meet the demand of beautiful wear, fit comfortably by consumers.

2. Subjects and research methods

2.1. Subjects of research

Vietnamese males of Kinh majority, living and working in Ho Chi Minh City, aged from 30 to 60 years old, voluntarily participated in the survey randomly. The sample size of the research was determined according to the formula:

$$n = \frac{t^2 \times SD^2}{m^2} = \frac{1.96^2 \times 4.96^2}{0,5^2} = 378.038$$

where: *n* is the sample number; probability or desired confidence level (*p* = 0.95); *t* is the margin of error or *z*-score (*t* = 1.96), m is the allowed measure error (*m* = 0.5), *SD* standard deviation (*SD* = 4.96 cm, is the head height standard deviation of preliminarily measuring of 150 samples randomly). The research surveyed 378 males randomly.

2.2. Object and scope of the research

Measuring subjects are randomly selected 378 middle-aged men aged 30-60, living in Ho Chi Minh City working in office and teacher environments. Study subjects were divided into 3 groups [1]: Group 1: 30-40 years, Group 2: 41-50 years, Group 3: 51-60 years old.

Analyzing the shape of the upper middle-aged body.

2.3. Research Methods

Cross-sectional research method: Using the US 3D Size Stream Body Scanner, measuring the monitoring of anthropometric measurements.

Data processing method: Using statistical probability math and SPSS 25 to determine statistical characteristics: average value (*M*), standard deviation (*SD*), coefficient of variation (*CV*).

3. Research results and discussion

The characteristics of statistics of male body size from 30 to 60 years (with 3 age groups: group 1 from 30-40 years old, group 2 from 41-50 years old, group 3 from 51-60 years old) after data processing by SPSS25 are shown in Table 1.

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Table 1. The value of HCMC middle-aged male body measurements from 30 to 60 years old

		Measurement	Symbol	M	Min	Max	SD	Me	Mo	CV%
The neck part	1	Head_height (cm)	Hh	23.61	19.55	27.72	1.56	23.56	23.62	6.62
	2	Neck height (cm)	Nh	7.88	4.25	11.77	1.47	7.86	7.76	18.66
	3	Neck Circumference (cm)	Nc	41.43	37.21	48.86	1.93	41.13	41.48	4.65
	4	Neck Width (cm)	Nw	13.39	11.86	15.96	0.84	13.32	13.43	6.25
	5	Neck Thickness (cm)	Nt	12.98	11.43	15.57	0.75	12.95	12.85	5.75
	6	Shoulder Height (cm)	Sh	136.91	125.65	149.61	4.73	136.44	136.46	3.45
	7	Shoulder Slope (cm)	Ss	4.82	3.13	6.84	0.82	4.84	4.84	16.94
	8	Back Shoulder Width Horizontal (cm)	Bsw	43.73	38.46	49.20	2.24	43.33	43.64	5.12
	9	Shoulder Length (cm)	Sl	14.14	10.53	18.09	1.29	14.13	14.08	9.11
	10	Shoulder Angle (°)	Sa	19.96	13.05	27.47	3.17	19.71	19.77	15.88
The arm part	11	Arm Length (cm)	Al	56.78	50.56	63.88	2.62	56.75	56.75	4.62
	12	Elbow Length (cm)	El	32.56	28.15	37.68	1.96	32.51	32.54	6.01
	13	Arm Hole Circumference (cm)	Ahc	45.33	37.49	53.90	3.06	45.51	45.55	6.74
	14	Bicep Circumference (cm)	Bc	29.65	24.50	35.63	2.16	29.76	29.91	7.30
	15	Elbow Circumference (cm)	Ec	26.96	22.65	31.74	1.53	26.94	26.94	5.69
	16	Forearm Circumference (cm)	Fc	26.71	22.64	30.99	1.42	26.56	26.79	5.32
	17	Wrist Circumference (cm)	Wc	17.00	14.21	20.99	1.03	16.94	16.78	6.08
The chest and back part	18	Chest Height (cm)	Ch	121.64	111.24	133.58	4.39	121.11	121.43	3.61
	19	Upper Bust Girth (cm)	Ub	99.42	85.62	114.01	4.81	98.94	99.75	4.84
	20	Chest / Bust Circumference (cm)	Cc	96.12	83.48	109.74	5.03	95.86	96.13	5.23
	21	Across Chest Arm to Arm (cm)	Aca	36.35	32.52	40.21	1.52	36.24	36.33	4.19
	22	Across Back Arm to Arm (cm)	Aba	38.73	34.74	43.23	1.66	38.65	38.87	4.28
	23	Bust to Bust Length (cm)	Btb	19.96	16.82	23.98	1.24	19.89	19.46	6.24
	24	Chest Width (cm)	Cw	34.30	29.45	39.23	1.68	34.15	34.63	4.89
	25	Chest Thickness (cm)	Ct	23.81	19.68	28.19	1.64	23.76	24.09	6.88
The stomach	26	Abdomen Circumference (cm)	Ac	88.08	73.65	103.77	6.09	88.02	88.06	6.92
	27	Neck to Back Waist (cm)	Nbw	49.04	41.76	56.93	2.60	49.04	49.02	5.31
	28	Neck to Front Waist (cm)	Nfw	47.47	40.03	55.29	2.76	47.51	47.48	5.81
	29	Front Abdomen Circum ference (cm)	Fac	45.40	35.08	57.93	3.58	45.05	45.04	7.89
	30	Back Abdomen Circum ference (cm)	Bac	42.68	34.12	51.27	2.95	42.38	42.85	6.91

3.1. Characteristics of the neck

The shape of neck is evaluated based on the ratio of neck width (Wn) to the neck thickness (Nt) [3]. Previous research [3] showed the ratio to classify male neck into 3 groups of neck types as follow: (1) the wide neck with ratio is 1 ± 0.05; (2) the average neck with ratio is 0.9 ± 0.05; (3) the slender neck with ratio is 0.8 ± 0.05.

Table 2. The average value of neck measurements

Measure-ment (cm) / The age group	Nh	Nw	Nt	Nc	(Nw/Nt)
Group 1	8.38	13.20	12.86	41.02	1.03
Group 2	7.81	13.49	12.94	41.53	1.04
Group 3	7.33	13.52	13.16	41.82	1.03
M	7.88	13.39	12.98	41.43	1.03

Summarizing the value of the size and the proportion of the neck of the three age groups of HCMC middle age men, is shown in Table 2. The result showed that:

- The higher the age, the shorter the height of the neck (Nh)

- Neck circumference (Nc), neck width (Nw), neck thickness ($\underline{Nt}$) are increasing with age gradually.

- Classification of neck shape: The ratio between the neck width and the neck thickness of HCMC middle-aged ranges from 1.03 -1.04, inferring the cross-sectional area of the circle type as in Figure.1a. That means their neck shape is a kind of wide.
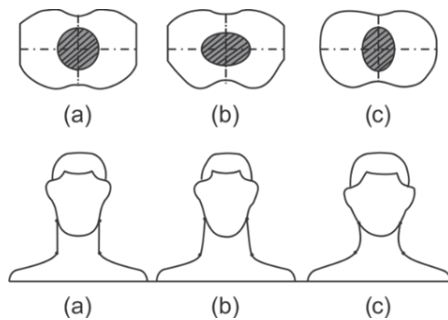

Fig. 1. Cross section of the neck

- According to the authors of research "Perception of body appearance and its relation to clothing" [2], the neck height is about 1/3 higher than the head height. Also, according to Table 1, the average value of middle-aged neck height (Nh) in Ho Chi Minh City is 7.88 cm, head height (Hh) is 23.61cm, thus the neck is in the form of average high neck.

3.2. Shoulder part characteristics

Characteristics of shoulder measurements for three age groups are summarized in Table 3 and Table 4.

Table 3. The average value of the shoulder part measurements

Size symbols	Group 1	Group 2	Group 3	M
Bsw(cm)	43.83	43.71	43.63	43.73
Sl (cm)	14.40	14.03	13.94	14.14
Sa (°)	19.00	20.32	20.78	19.96
Ss (cm)	4.68	4.87	4.95	4.82

Evaluating the balance between right and left shoulders for the three age groups is shown by the dimensions in Table 4.

Table 4. The average value of right and left shoulder height, shoulder slope.

Age group / Size symbols	Group 1		Group 2		Group 3	
	Left shoulder	Right shoulder	Left shoulder	Right shoulder	Left shoulder	Right shoulder
Sh (cm)	138.32	137.66	137.17	136.29	136.12	135.36
Sa (°)	18.52	19.48	19.78	20.86	20.13	21.42

The results from Table 3 and Table 4 affirm some facts are:

- The shoulder width (Bsw) and the shoulder length (Sl) are shorter when older.

- The shoulder width (Bsw) or shoulder angle (Sa) gradually increases with age, but this increasing number is not large, only from 4.68 cm to 4.95cm. The shoulder angle (Sa) from 19.0(°) to 20.78(°) increases by nearly 2(°), because of the older, the shoulder and the shoulder height are sluggish but not significant.

- The shoulders shape of HCMC middle-aged male can be classified as the average shoulder. Their shoulder shape could be described as: a large slope from the shoulder intersecting neck point to the shoulder point, and from the shoulder point to the point of the shoulder outer edge is almost horizontal.

- The right shoulder height (Sh) is lower than the left; The right shoulder has a shoulder angle (Sa) higher than the left. Therefore, it could be summed up with a a result that the right shoulder is saggier than the left shoulder.

3.3. Arm part characteristics

The average values of the arm measurements of HCMC middle-aged male are presented in Table 5.

Table 5. The average values of arm measurements

Measurement symbols (cm)	Group 1	Group 2	Group 3	M
Al	57.02	56.96	56.28	56.78
El	32.81	32.75	32.06	32.56
Ahc	44.90	45.34	45.86	45.33
Bc	29.40	29.72	29.91	29.65
Ec	26.57	26.69	26.89	26.71
Fc	26.79	26.90	27.24	26.96
Wc	16.82	16.97	17.23	17.00

The characteristics of arm measurements for three age groups are summarized as follow:

- Length of the arm: The older the length of the arm (*Al*), the shorter the arm is.

- Armhole circumference (*Ahc*), biceps circumference (*Bc*), elbows circumference (*Ec*), forearm circumference (*Fc*) and wrist circumference (*Wc*): all measurements are increasing with age. It is because the older people get the more fat accumulate.

- Classification by arm length: Through table 5, we can see that the Arm length of middle-aged male in Ho Chi Minh City is in the range of 56,28 cm - 57,02 cm and is classified as medium arm length.

3.4. Characteristics of chest and back

Table 6 presents the average value of the measurements for the chest part of HCMC middle-aged male. The values showed that:

- The chest height (*Ch*) is getting lower when person is getting older, because the intervertebral disc between the vertebrae gradually collapses over time.

- The chest circumference (*Cc*) gradually increases with age, because the older the age of 50-60 years of excess fat accumulates more.

- Bust to bust (*Btb*) gradually increases with age, because of the fat

- Body form for male are evaluated based on the Lorent Index [3]. Reference shows that: Lorent index = Chest circumference at armpit level (*Cc*) – Waist circumference (*Wc*). The characteristic of male body form is classified according to Lorent Index: when Lorent index > 14 is a thin person; Lorent Index = 14 is the average person; Lorent Index <14 is fat person. When evaluate the body form by Lorent Index, the results of HCMC in three age groups are 13.28, 11.5, 8.75 in relation to group 1, grops 2, group 3, as showed in Figure 2. All are lower than 14 and this is meant that HCMC middle-age male have the fat body form when evaluate the body form by Lorent Index.

- Chest circumference (*Cc*), chest thickness (*Ct*), chest width (*Cw*) have important implications for the shape of the chest. Through Table 6 and Figure 3, it is realized ratio Aba/Aca is 1.06 and 1.07, which belongs to the average chest type.

- The classification of middle-aged chest shape: Group 1 has more back muscles than the following two groups, because the Aba/Aca ratio is the lowest.
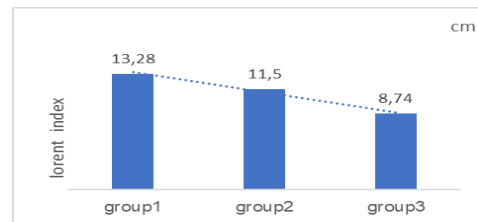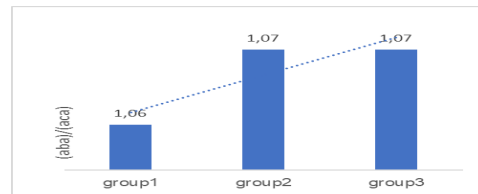

Fig. 2. Lorent index of HCMC middle-age male

Fig. 3. Aba/Aca ratio of three age groups of HCMC middle-aged male

Table 6. The average value of chest measurements

Measurement symbols (cm) / The age group	Ch	Ubg	Btb	Cc	Aba	Aca	Ac	Cw	Ct
Group 1	122.82	99.16	19.59	95.12	38.43	36.28	85.88	34.19	23.54
Group 2	121.51	99.43	19.99	95.87	38.86	36.34	87.93	34.23	23.71
Group 3	120.30	99.72	20.38	97.62	38.99	36.45	90.98	34.51	24.24
M	121.64	99.42	19.96	96.12	38.73	36.35	88.08	34.30	23.81

- The characteristics of the back can be seen through measurements depth waist length and the difference (*Nbw*) – (*Nfw*).

- Depth waist length: value front waist length (*Nfw*) and the back-waist length (*Nbw*) of group 3 for this measurement is lower than other groups, thus proving that the older person get, the back length is reduced, because the disc between the vertebrae is collapsed.

- The difference between the back-waist length (*Nbw*) and front waist length (*Nfw*) and the gradually increases with age as showed in Table 7, thus proving that the older person is getting, the back is getting more curved.

Table 7. Difference between the back-waist length and the front waist length

Measurement Symbols (cm) The age group	Nbw	Nfw	(Nbf - Nfw)
Group 1	49.68	48.25	1.43
Group 2	48.89	47.30	1.59
Group 3	48.40	46.67	1.73
M	49.04	47.47	1.57

Table 8. Summarize the average value of abdominal sections

Measure-ment (cm) The age group	Fac	Bac	Ac	Cc	(Cc–Ac)
Group 1	44.01	41.87	85.88	95.12	9.24
Group 2	45.18	42.75	87.93	95.87	7.94
Group 3	47.37	43.61	90.98	97.62	6.64
M	45.40	42.68	88.08	96.12	8.04

3.5. Abdominal characteristics

Research results of abdominal measurements are shown in Table 8. Results were analysed and discussed as follow:

- As the age increases, waist circumference (*Ac*) increases. HCMC male in the age of 50-60 have the largest waist in compared to other groups. They have front waist is larger than the back waist. Research also found that when person gets older, difference between the front waist and back waist is getting larger.

- When person is getting older, his chest and abdomen become bigger, but the abdomen is increasing bigger than the chest.

Thus, according to Table 8, the abdomen of HCM City middle-aged male is convex.

4. Conclusion

The study researched 378 HCMC middle-aged male according to 3 age groups and analysed upper body shape according to 30 main measurements. All the measurements were measured by Size Stream 3D scanner.

Characteristics of the neck: The cross-sectional area appeared round shape, wide-neck type with an average high neck.

Shoulder characteristics: The slope of shoulder increases when age increases. The shoulders are in the common shape, the right shoulder is shorter than the left shoulder.

Characteristics of the chest and abdomen: The circumference increases when age increases, leading to the width also increases. The front part circumference increases more than the back part.

Characteristics of the back: When person gets older, the back is curved more leading to the bigger difference between the back waist and front waist.

Characteristics of arm: Armhole, bicep circumference, elbow and wrist circumference are gradually increasing with age. The arm length is medium form.

The result of this study is an important basis for application of suitable clothing design for Ho Chi Minh City middle-aged male.

Acknowledgement

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